Career in the Academia

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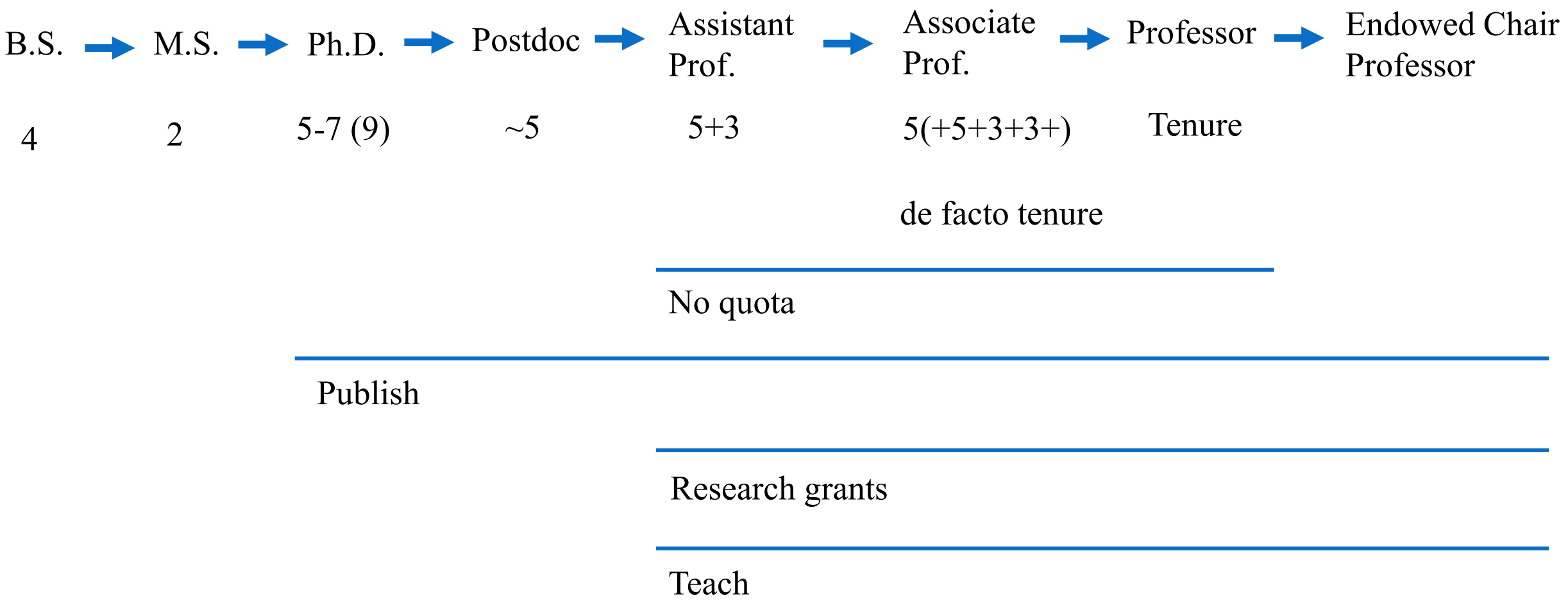
Helped by ChatGPT 4o

Outline

- **Career paths in and beyond academia**
- Planning and chance in academic career: my personal journey
- Dilemma and choices in academic career
- Choice of career

Career path in Academia

Researcher + Educator



Classical career path in academia

Tenure-track faculty position (university or research institutions)

Ranks

- Ph.D. student
- Postdoctoral fellow
- Assistant professor
- Associate professor ← tenure
- Full professor ←
- Chair professor

Research + Teaching

Grants

- Individual
- Program project

Administration positions

- Department Chair; Institute Director
- College Dean
- University President

Honors

- Academician (Academia Sinica in Taiwan)
- Member of National Academy of Sciences (USA)
- Nobel Prize

Alternative Paths Within Academia

- Research-only roles
  - Research faculty (soft-money; non-tenure track; contract-based; independent)
  - Research scientist (under a PI; not independent; no pressure to get grant; no job security)
- Teaching-focused careers
- Interdisciplinary and industry-linked positions

Careers Beyond Academia

- Industry R&D
  - •Application-driven, with short-to-medium term timelines
  - •Team-based; Hierarchy
  - •Structured projects: clear deliverables, deadlines, and performance metrics.
  - •Resources often better; Generally higher salary
  - •Confidentiality (restrictions on publications or talks)
  - •Not independent; no freedom to explore
- Sales or tech support for tech company
- Science communication
- Policy and government
- Consulting and entrepreneurship

Key Skills for Academic Success

- Research excellence: publications, funding, innovation
- Teaching effectiveness: course design, student engagement
- Service and leadership: committees, outreach, peer review
- Communication: academic writing, presentations, grant proposals
- Networking and collaboration

Productivity: publish or perish

Publications

- Primary research papers
- Reviews
- Book chapters
- Books

Translation

- Patents (strategy)
- Tech transfer (upfront, milestones, royalty, equity)
- Startup company

Challenges in Academia

- Job market competitiveness (timing)
- Publish-or-perish pressure (timing)
- Grant funding stress
- Work-life balance and mental health
- Institutional politics

Strategies for Success

- Building a strong research team
- Building a strong research portfolio early
- Finding good mentors and being a good mentee
- Time management and prioritization
- Learning to write effective grant applications
- Resilience and dealing with rejection

Your research portfolio

- Research Focus and Vision
- Publications
- Grant Record
- Collaborations and Networks
- Methodological and Technical Skills
- Mentoring and Supervision
- Outreach and Impact
    - Science communication, public talks, policy engagement
    - Datasets or software shared with the community
    - Citations, media mentions, invited talks
    - Community services

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Planning and chance in my career path

High School (1st yr): determined on a research career in biology (choice)

- Good biology teacher (chance)
- Family

Dept Botany, NTU

- 1st choice, instead of M.D. in NTU

Caltech (Ph.D.)

- Harvard, MIT, **Caltech**, UCSD, U. Oregon (chance)
- Mentor: Leroy Hood (choice)
- Project: mouse MHC (choice/chance)

Job offer from IMB (Taiwan)

Postdoc

John Carlson (Yale), olfactory receptor (choice)

PI position

1988 political crisis in Taiwan

- IMB, AS (chance + choice)

Choosing a postdoc lab (1985)

Applied to 10 labs

- Seymour Benzer (Caltech) (Lasker 1971)
- Elliot Meyerowitz (Caltech) (NAS 1995)
- Gunther Blobel (Rockerfeller) (Nobel 1999)
- Richard Palmiter (U. of Washington) (NAS 1988)
- Soloman Snyder (Johns Hopkins) (Lasker 1978)
- Utpal Banerjee (UCLA) (NAS 2018)
- Bill Wood (Colorado) (NAS 1972)
- Bob Horvitz (MIT) (Nobel 2002)
- Corey Goodman (Stanford) (NAS 1995)
- **John Carlson** (Yale) (NAS 2012)

- Make judgements
- Determined to go back to Taiwan. Need to find a topic I can do in Taiwan
- Direction for future career

- New Faculty; 1st postdoc
- Built the lab together from zero

Choice of projects: by design vs. by chance

- Unsolved significant problem => design approach
- Unexpected results => potential significance => follow up

- PhD thesis:

  Molecular Basis of the *dm1* Mutation in the Major Histocompatibility Complex of the Mouse: a *D/L* Hybrid Gene. ***J. Exp. Med***. (1985) 162: 1588-1602.

- My postdoc project: Fly olfactory receptor (mutant screen)

  No 1st author paper in 2 yr.

- Fly eye development: chance discovery
- Glia-neuron interactions

Attempts to find the olfactory receptors

Assessment

- **Behavior assays for *Drosophila* (function)**
- **Existing mutants (including odorant-specific mutant)**
- **Screen for P element-tagged mutant => clone**
- ***Drosophila* is a good model system (inexpensive, sharing)**
- **Piece of cake!**

Result

- **2-yr postdoc: very little progress, no paper**
- **Try alternative approaches**
- **1991, Richard Axel and Linda B. Buck (2004 Nobel Prize)**

- Survival crisis (1st reappointment; warning)
- Confidence crisis
- Perseverance of change?
- Do small projects. Publish small papers.
- Big pressure

I do research for the fun and challenge. Want to make an impact. Not to keep a job.
=> keep working !

Switch to eye development (chance)

Unexpected finding

- Interesting. Teaching makes me think of potential significance.
- Experimental verification => feasible => abandon original project
- Difficult to switch field (need to know people)

Important help

- **Prof. Mel Green**
- **Crete Fly Meeting （getting to know the core group）**

Sun et al (1995) *Genetics* => reappointment !

Stages in my research

Phase I: Gene-centered (led by discoveries) **(chance)**

Expression pattern => Genes => Function?

Phase II: Problem-oriented (choice)

- Spatial-temporal coordination of cell proliferation
- Coordination of proliferation and differentiation
- Dorsoventral specific regulation
- Determination of eye and antenna fates

Phase III: Finding new problems (eye => visual system) (choice)

- Eye-antenna fate segregation & boundary formation
- Trachea ingrowth
- Eye-brain (photoreceptor-glia) interactions
- Role of glia in neural degeneration

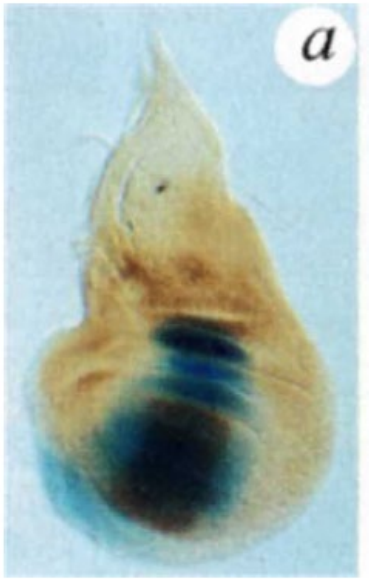
Phase IV: Wild ideas (choice)

Sharing increases value

Two distinct mechanisms for long-range patterning by Decapentaplegic in the *Drosophila* wing

Thomas Lecuit, William J. Brook, Medard Ng, Manuel Calleja*, Henry Sun† & Stephen M. Cohen

Nature 381: 387-393 (1996)



Spalt + omb-lacZ
wild-type

- Sharing of tools, reagents, databases => increases value
- Sharing before publication => co-authorship

Rebuttal sometime works

- Submitted 7/28/1998 to ***Development***
- 9/7/1998 Editor: "Both experts clearly recommend publication. …I am happy to tell you that we are, in principle, ready to consider this work for publication in Development."

Timely vs complete

- Resubmitted 4/27/2002
- Rejected 7/10/2002 "However, I will leave the possibility open for a re-submission if you can extend the study to include clonal analyses as suggested by the reviewers, but it would have to be re-reviewed.

- Resubmitted 11/8/2002
- Review 12/10/2002
- Revision submitted 2/27/2003
- Review 3/20/2003 "As you will see, referee 1 raises a number of substantial criticisms which prevent me from accepting the paper at this stage. However, referee 1 does suggest that a revised version might prove acceptable, "
- **Rebuttal** 3/21/2003
- **Accepted** 3/25/2003

A manuscript > 14 yrs

Optomotor-blind negatively regulates *Drosophila* eye development by blocking Jak/STAT and Dpp signalings

Yu-Chen Tsai[1,2], Stefan Grimm[3+], Ju-Lan Chao[1], Shih-Chin Wang[2], Kerstin Hofmeyer[3*], Jie Shen[4,5], Fred Eichinger[4], Theoni Michalopoulou[4], Chi-Kuang Yao[1¶], Shih-Han Lin[2], Y. Henry Sun[1 §], Gert O. Pflugfelder[3,4 §]

***PLoS One* 2015**

Serendipity

PLOS ONE

RESEARCH ARTICLE

Long Term *Ex Vivo* Culture and Live Imaging of *Drosophila* Larval Imaginal Discs

Chia-Kang Tsao[1,2☯], Hui-Yu Ku[1,2☯], Yuan-Ming Lee[1,2], Yu-Fen Huang[1,2¤], Yi Henry Sun[1,2*]

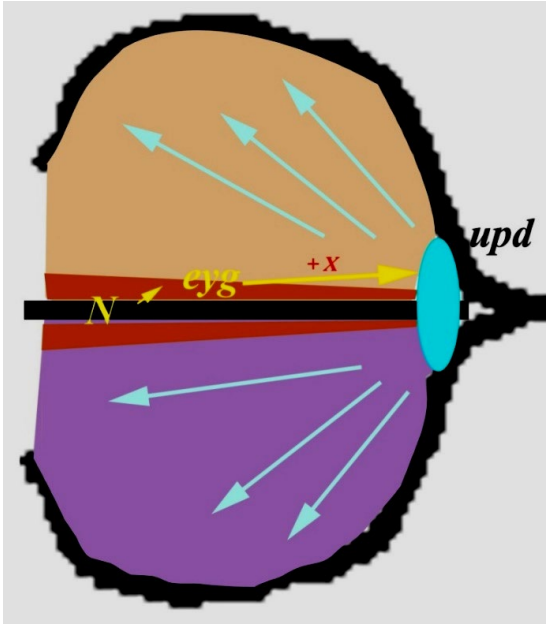
Tried for several years without success.

Sudden success due to mis-calculation of reagent concentration.

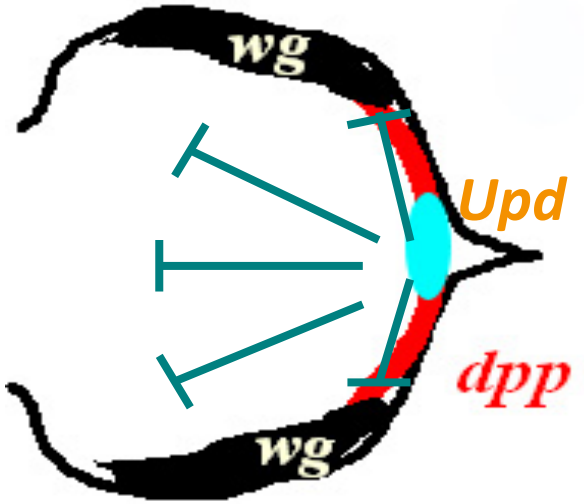
Impact factor is not that important

Spatial and temporal coupling of growth and differentiation

proliferation



initiation of eye differentiation



	IF	Citations
• Tsai and Sun (2004) ***Genesis***	2.93	146
• Chao et al. (2004) ***Development***	7.57	150
• Tsai et al (2007) ***Dev. Biol.***	4.89	60

Competition brings out efficiency!

Three labs, different directions, independent studies, published within a few months.

Nuclear Translocation of Extradenticle Requires *homothorax*, which Encodes an Extradenticle-Related Homeodomain Protein

Gabrielle E. Rieckhof, Fernando Casares, Hyung Don Ryoo, Muna Abu-Shaar, and Richard S. Mann*

Cell, Vol. 91, 171–183, October 17, 1997 — Embryo segmentation

The Homothorax homeoprotein activates the nuclear localization of another homeoprotein, Extradenticle, and suppresses eye development in *Drosophila*

Chi-Yun Pai, Tung-Sheng Kuo, Thomas J. Jaw, Estee Kurant, Cheng-Tse Chen, Dmitri A. Bessarab, Adi Salzberg, and Y. Henry Sun

GENES & DEVELOPMENT 12:435–446, February 1, 1998 — Eye

dorsotonals/homothorax, the Drosophila homologue of meis1, interacts with extradenticle in patterning of the embryonic PNS

Estee Kurant, Chi-yun Pai, Rakefet Sharf, Naomi Halachmi, Y. Henry Sun and Adi Salzberg

Development 125, 1037-1048, March 15, 1998 — Embryonic PNS

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Competition vs. collaboration

- Leaking info vs. exchange info
  - You learn important (unpublished) info by talking with others.
  - You learn info by giving info. (a trade-off of risk vs opportunity)
  - Trust is built by personal interactions.
  - Private chats in conferences are very important
  - Protect critical information

- Competition brings out efficiency.

- Success does not have to step on other people
  - Can coordinate publications.

Can do vs. Should do

Can do:

- Collect info first, think later.
- Expect solution to be obvious. (資料庫)
- Busy work. 虛工

Should do:

- **Ask the critical question.**
  - **Same amount of work, ask right question => greater impact!**
- What do I need to do to answer the question?
- What is the best approach? (consider alternatives)
- Can this approach give me the answer?
- How to follow up (extend the story)?

Impact vs. Papers

- **Publish or Perish**
- **Job or Career?**
- **Don’t forget original dream, make an impact**

Mainstream vs. Unbeaten path

Mainstream

- Significance well known
- Main questions and approaches are also well known
- Many competitions
- Compete by efficiency
- Innovation? (difficult)

Unbeaten path (or against mainstream)

- Fight to gain acceptance
- May open up new territory and become leader
- Define the problem. Leading.
- Fun!

- **Trailblazing**
- **Evolution: Niche occupied by many competitors. Need to find new niche or change tactics.**

Comfort zone vs. Taking risk

Focus vs. Diversify

- **Bread-and-butter project (guaranteed productivity)**
- **Explore (new methods, new questions)**
- **Set priority (choose and let go 有取有捨)**
- **Stick to one theme vs. seeking new directions (從一而終 vs.喜新厭舊)**

For any project, first ask what will be the title (punchline, selling point) of the paper? (best case scenario) => worth the investment?

Basic vs. Applied

- **Basic: intellectual curiosity; mechanism (why?)**
- **Applied: with a practical problem to solve**
- **Basic questions within applied problems**
  - **glia-neuron interactions (signaling mechanisms)**
  - **in development and diseases**
- **Industry-Academia gap: end points (paper/patents vs. useful)**
- **Need to know the need of end users**
  - **e.g. cataract（turbid lens）**

Cultivate vs. Exploitation (Teacher -Student)

- Apprenticeship: some overlapping goals
- Win-Win
- My Three No's policy: no initiative, no refusal, no responsibility
- Learn from teaching
- Micromanage vs. Free ranging (allow trials and errors, independence)
- Like challenges from students
- Provide: environment for open discussion; scientific taste
- Let students see my love for science
- In research, I am the boss. (?) As persons, we are all equal.

Self-fulfillment vs. Community Responsibility

- Reviewing
- Mentoring
- Community services
- Committees
- Administrative positions

What's in it for me?

Altruism in evolution: benefit from helping others

Widens perspectives

- Fly community
- Developmental biology
- Neuroscience
- Research ethics

- Deputy Minister, National Science Council
- Pioneer grant program

Learning: textbooks vs. casual readings

My learning

- Textbooks, reviews, primary research papers
- Catalogues
- Science fictions, comics
- Observations（知識、常識、夜市、自然、研究對象）
- Browse vs. Search

Breakthrough often comes from introducing new concepts, technology from different fields. (Bruce Alberts)

- **Widely-read; Well-connected**
- **Interdisciplinary collaborations**

Choosing a lab: Big name vs. Young PI

- Intellectually stimulating environment
- Learn taste/judgement
- Opportunity to learn
- Connections, influence
- Resources

- Two-sided selection

- **Your development should not be limited to your lab and department**
- **Learn from many people**

Pursuit of excellence vs.
追求卓越 vs. 安逸守成

- 全心投入、辛苦
- 挑戰性、自我滿足

- 守成、輕鬆
- 無挑戰性、無成就感
- **Red Queen:** 守成也得努力

- 卓越 is relative.
- 超越自我

壓力： 自我 > 同儕 > 體制

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Academia vs. Industry

Academia

- Passion for research and discovery
- Intellectual challenging
- Contributing to knowledge and society
- Intellectual freedom and autonomy
- Love for teaching and mentorship

- For me, it is the best job in the world !

- Learnt to solve problems.
  => wide market (not limited to academia)
- Make yourself special. (interdisciplinary)

Industry

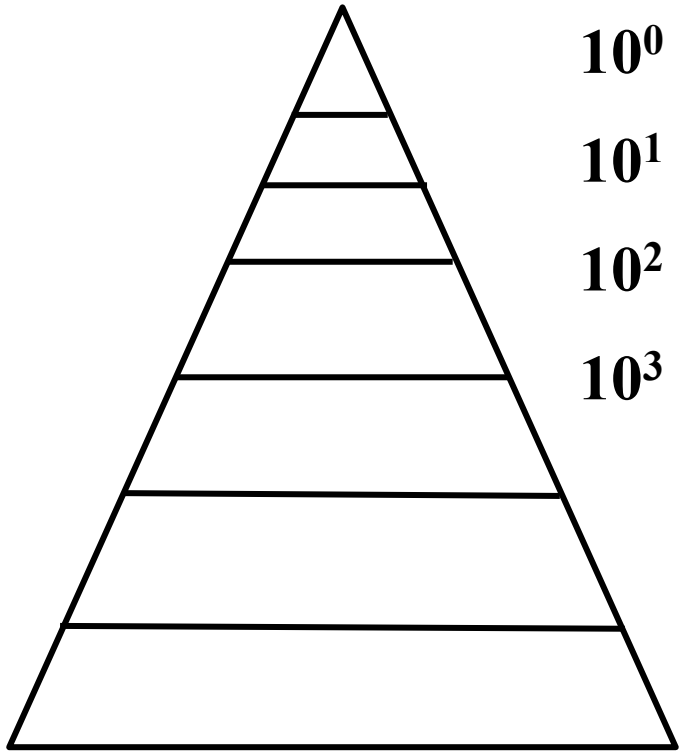
- Usually higher pay
- Less autonomy
- Less secure

Start-up company

- Challenging !
- Potentially very high rewards
- Risky

Academic pyramid

Dr. Ta-You Wu is a third-rate scientist (meant as a compliment)



10^0 Newton, Einstein, Darwin

10^1 Watson, Crick,

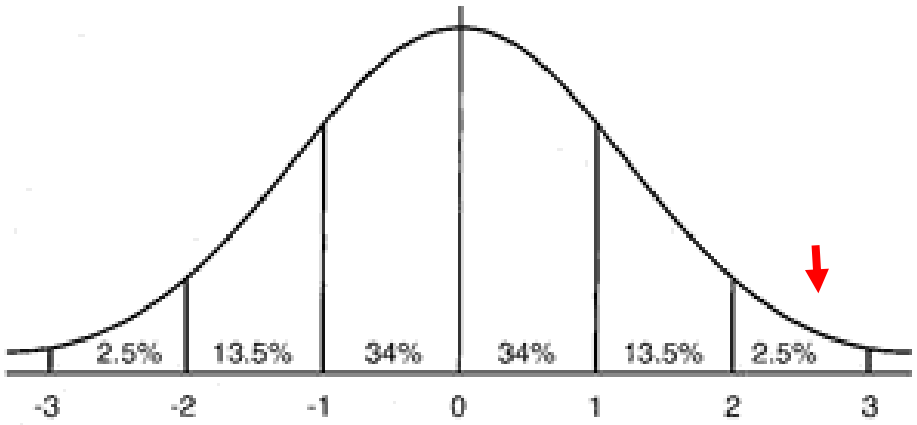
10^2 Distinguished Nobel laureates

10^3

Where am I? Where would I be?

Would I be satisfied with my position in the ladder?

My place in the distribution curve



- Compare with yourself, not to others.
- Place your talent in the right place.
- follow the trend/market?
- Still need to analyze the market

Many qualities

- **Even if you are good, there are always people better than you. (long tail curve)**
- **Even if you are good, there are always people better than you in other qualities.**
- **Success requires many qualities.**
- **It is normal to be in the middle of the curve（by definition).**

What do you want in life?

- Job vs. Career
- Making contribution and impact
- Fame (recognition by others) (be remembered by)
- Money (indicator of success?)
- Self satisfaction

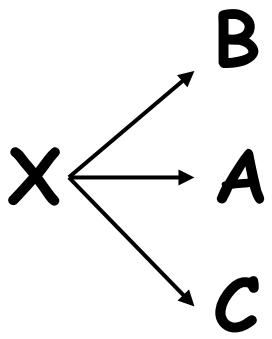
success $\neq$ happiness

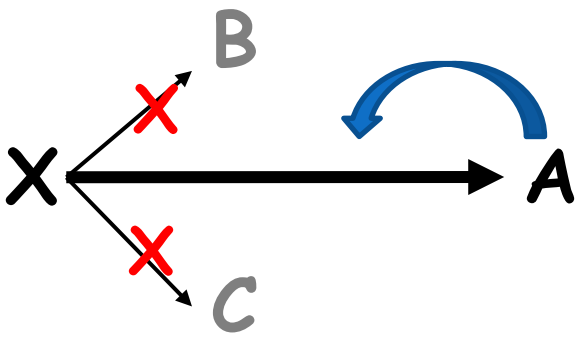
Enjoy the journey.

Don’t be driven by the metrics.

Choices, Feedback and Plasticity

Same principle: developmental choice, studying, finding work, finding mate





- Select among limited options
- Chance
- Establish priority
- Don't look for the largest rock
- Interactive process
- Follow your passion, and commit to your choice.

- Positive feedback
- Amplify preference
- Self maintenance
- Fate choice
- Block other pathways
- Restricted potential
- To choose is also to let go.

- Plasticity
- External signal
- Weakened feedback
- Change of fate
- Don't be restricted by your past

Q&A

Research & Career Path

- How did your time at Caltech and Yale shape your scientific thinking?
- What advice do you have for students deciding between academia and industry?

Leadership & Policy Experience

- What was it like serving as Deputy Minister of the National Science Council?
- How do you balance administrative leadership with running a research lab?
- What impact have you seen from science policy decisions on basic research in Taiwan?

International Experience & Collaboration

- How can young scientists build international collaborations early in their careers?

Q&A

Advice on Academic Progression

- How did you navigate each stage of your academic career in Taiwan?
- What makes a strong postdoc experience?
- What qualities do you look for in students or junior researchers?

Science, Change & Purpose

- Has your view of “what science is for” changed over time?
- If you could start your career again today, would you do anything differently?
- What keeps you curious and motivated after decades in the field?

Follow your passion, and commit to your choice

Get into a **positive feedback mode** (for whatever you do).