

Career Path in the Academia

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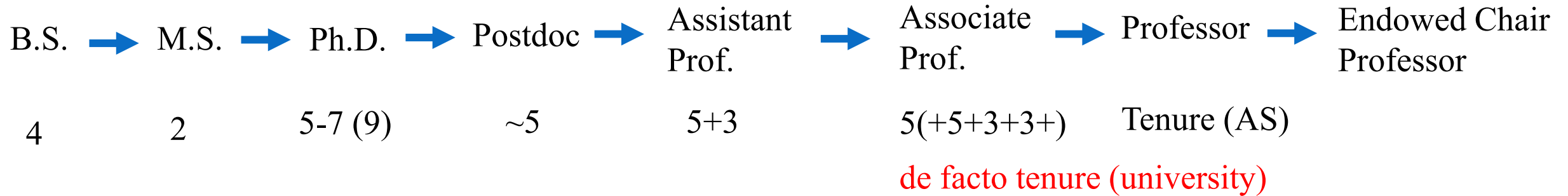
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Outline

- **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



No quota of professorship

Publish

Research grants

Teach

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)
- Major Awards (Lasker, 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
- **Use AI well.**

Productivity: publish or perish

Publications

- Primary research papers
- Reviews
- Book chapters
- Books

Translation

- Patents (patent portfolio strategy) (may not be useful)
- 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

- Choice of research projects
- Building a strong research portfolio early
- Building a strong research **team**
- 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

- IMB, AS (**chance + choice**)

1988 political crisis in Taiwan

Choosing a postdoc lab (1985)

Applied to 10 labs

- Seymour Benzer (Caltech) (Lasker 1971)
 - Elliot Meyerowitz (Caltech) (NAS 1995)
 - Gunther Blobel (Rockefeller) (Nobel 1999)
 - Richard Palmiter (U. of Washington) (NAS 1988)
 - Solomon 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)

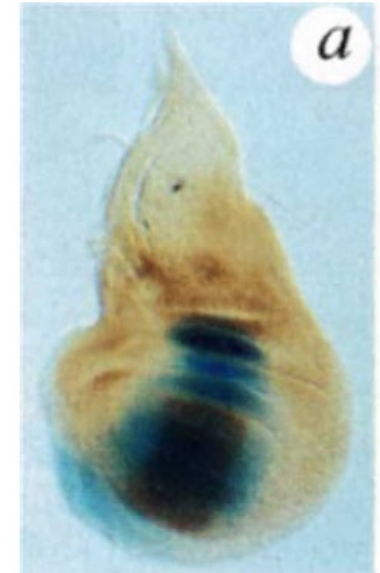
Sharing increases value

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)

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



Spalt + omb-lacZ
wild-type

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 Grimm³⁺, Ju-Lan Chao¹, Shih-Chin Wang², Kerstin Hofmeyer^{3*}, Jie Shen^{4,5}, Fred Eichinger⁴, Theoni Michalopoulou⁴, Chi-Kuang Yao^{1¶}, Shih-Han Lin², Y. Henry Sun^{1 §}, Gert O. Pflugfelder^{3,4 §}

***PLoS One* 2015**

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}*

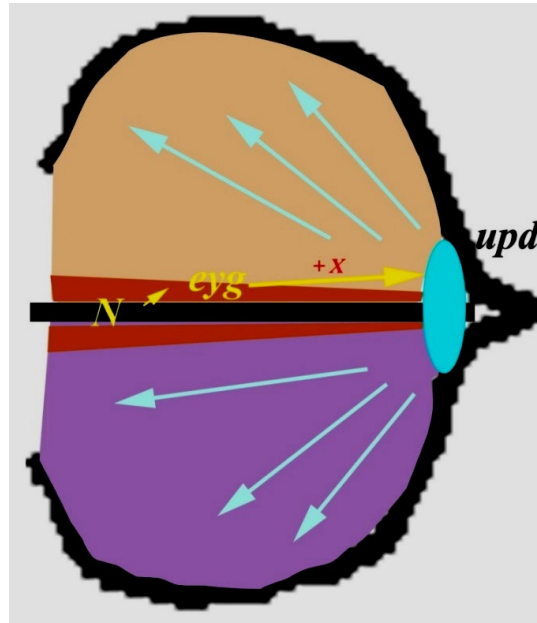
Tried for several years without success.

Sudden success due to mis-calculation of reagent concentration.

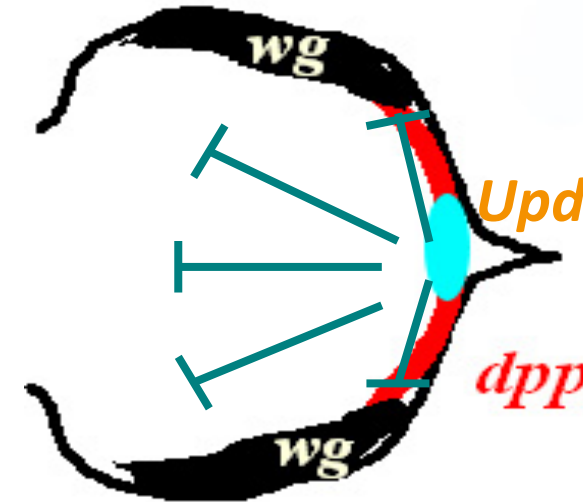
Impact factor is not that important

Spatial and temporal coupling of growth and differentiation

proliferation



initiation of eye differentiation



- Tsai and Sun (2004) *Genesis*
- Chao et al. (2004) *Development*
- Tsai et al (2007) *Dev. Biol.*

IF Citations

2.93 146

7.57 150

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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Minimum Publishable Unit vs. The Big Story

Publishing **timely** is important

Waiting for a comprehensive, perfect, high-impact story

- Risk of being scooped

Publish fast: lead paper + follow-up papers

Preprint: **bioRxiv** or **arXiv**: Establish priority

- A community-acknowledged timestamp — colleagues in the field do informally recognize preprint priority (reputational and conventional)
- The published date (or acceptance date) remains the formally recognized date for most institutional, grant, and legal purposes
- Priority disputes are ultimately resolved by the scientific community through consensus, not by a journal's official policy.

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
- Fly community
- Developmental biology
- Neuroscience
- Research ethics
- Ombuds

What's in it for me?

Altruism in evolution: benefit from helping others

Widens perspectives

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
- **AI**

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

- Mutual selection

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

Pursuit of excellence vs. Comfort zone

- **Devoted. Hard.**
 - **Challenging**
 - **Self fulfillment**

 - **Excellence is relative.**
 - **Be a better self.**
- **Comfort zone. Easy.**
 - **Not challenging.**
 - **No sense of accomplishment.**
 - **Red Queen: Need to work hard just to stay in the same place.**

Pressure: **self** > peer > system

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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

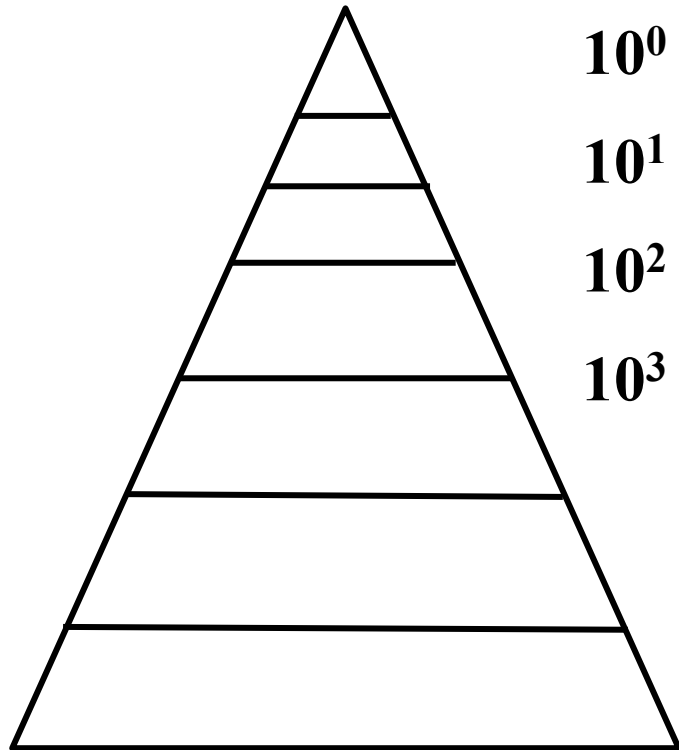
- Usually higher pay
- Less autonomy
- Less secure

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,

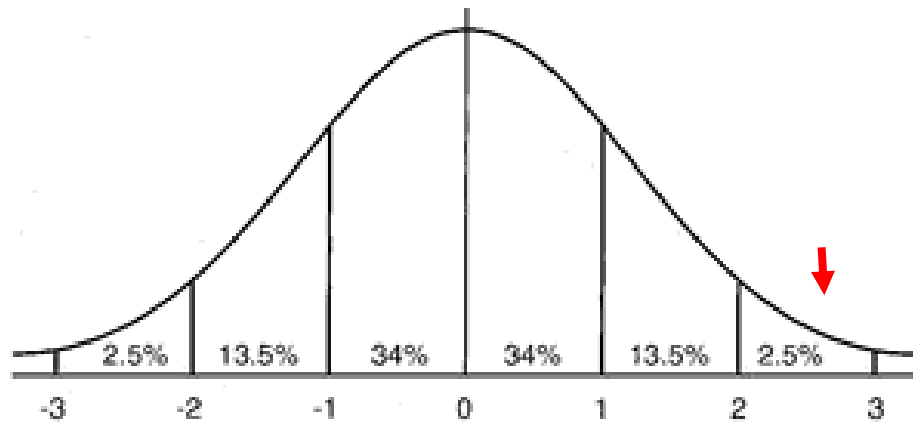
10^2 Distinguished Nobel laureates

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

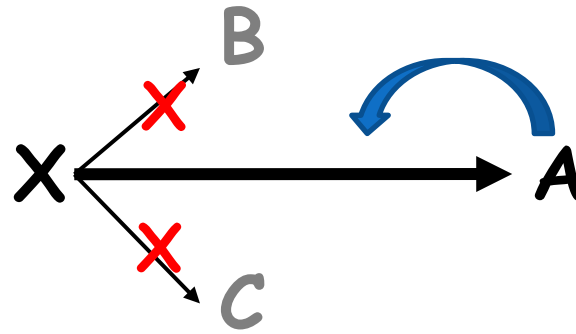
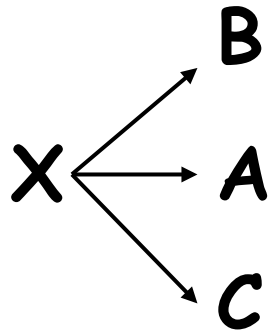
success \neq happiness

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**

Follow your passion, and commit to your choice

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

