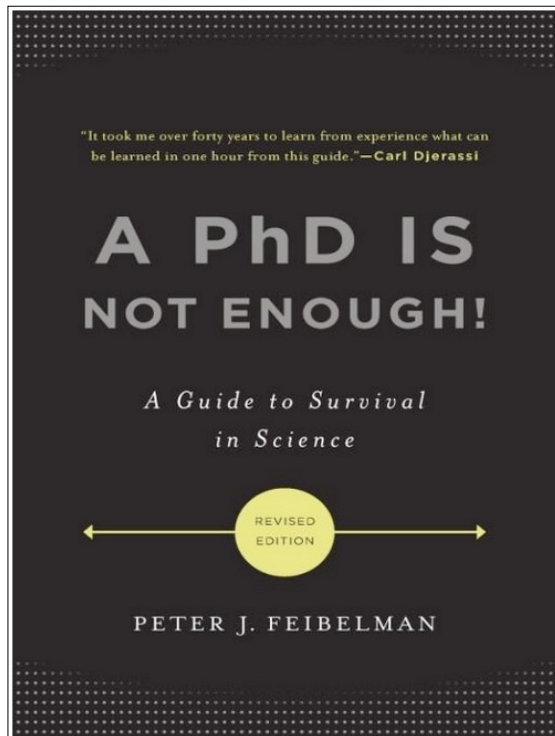


# Physics Grad School Application “Boot Camp”



This book is useful for  
your time  
*in grad school and beyond.*

**Email me** if you  
would like a hard copy.

Jaideep Taggart Singh  
Experimental Nuclear Science @ FRIB / MSU  
[singhj@frib.msu.edu](mailto:singhj@frib.msu.edu)

2021-09-13 @ 1900 on Zoom **(First Part Will Be Recorded)**

# Outline (Slides are recorded.)

0. My grad school application journey...
1. Should I apply to grad school?
2. How should I decide which programs to apply to?
3. What are the parts of the grad school application?
4. How do I request letters of recommendation?
5. What do I write about for my statements?
6. Should I take the Physics GRE?
7. What should I do during the grad school visit?
8. What is the timeline for the application process?
9. How much is the total cost out of pocket cost for me from application to matriculation?
10. What are some insights from the admissions committee perspective?
- 11. Ask me anything (not recorded)**

# My Credentials

STUDENT INFORMATION				ACADEMIC RECORD				INSTITUTION																																																																																																																								
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# My Credentials

PAGE TWO

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Dept.	Course Number	DESCRIPTIVE TITLE	Units Attempted	Units Earned	Grade	Credits	Dept.	Course Number	DESCRIPTIVE TITLE	Units Attempted	Units Earned	Grade	Credits
SINGH, JAIDEEP													
1ST TERM 1998-99													
*L	165A	RUSSIAN LIT TRANSLATION	9	9	P	0							
*SE	157	SCI IN AMER, 1865-PRESEN	9	9	B	27							
PH	C9EA	QUANTUM PHYSICS	9	9	C	18							
PH	129A	MATH METHODS PHYSICS	9	9	B	27							
**	CLM UE	306 CR 540 GPA 3.0	36	36		72							
SINGH, JAIDEEP													
2ND TERM 1998-99													
*L	165B	RUSSIAN LIT TRANSLATION	9	9	C	0							
LAW	133	TELECOMMUN REGULATION	9	9	D+	12							
PH	C9EB	QUANTUM PHYSICS	9	9	C	18							
PH	129B	MATH METHODS PHYSICS	9	9	D+	12							
**	CUM UE	333 CR 500 GPA 2.8	26	27		42							
SINGH, JAIDEEP													
3RD TERM 1998-99													
ART	118	MODERN ART	9	9	P	0							
EC	011	INTRO TO ECONOMICS	9	9	B-	24							
PH	C9BC	QUANTUM PHYSICS	9	9	B	27							
PH	106C	TOPS IN CLASSICAL PHYSIC	9	9	C-	15							
**	CUM UE	369 CR 645 GPA 2.7	36	36		63							
Singh, Jaideep													
1st TERM 1999-2000													
BEM101	Introduction To Accounting		9	9	A+	39							
Ph 076A	Atomic/Laser Physics Laboratory		9	9	B+	30							
Ph 078A	Senior Thesis Experimental		9	9	A+	39							
Ph 205A	Relativistic Quantum Mechanics		9	0	F*	0							
**	CUM UE	396 CR 753 GPA 2.9	36	27		108							
Singh, Jaideep													
2nd TERM 1999-2000													
Ch 003A	Fundamental Techniques Of Experimental Chemistry		3	3	P	0							
PE 084B	Table Tennis, Beginning, Intermediate, And Advanced		3	3	P	0							
Ph 070	Oral Presentation		9	9	B-	24							
Ph 077A	Advanced Physics Laboratory		9	9	A+	39							
Ph 078B	Senior Thesis Experimental		9	9	A-	33							
SESH 169	Selected Topics In Science, Ethics, And Society		9	9	A-	33							
**	CUM UE	435 CR 849 GPA 2.9	39	39		63							
Singh, Jaideep													
3rd TERM 1999-2000													
APH077C	Laboratory In Applied Physics		9	9	C-	15							
LLR 162	Spanish And Latin American Literature In Translation		9	9	C-	15							
Law 133	Topics In Anglo-American Law		9	9	C+	21							
PE 001C	Student Designed Fitness		3	3	P	0							
PE 070C	Weight Training, Beginning/Intermediate		3	3	P	0							
Ph 078C	Senior Thesis Experimental		9	9	A+	39							
Ph 103B	Topics In Contemporary Physics		9	9	C+	21							
**	CUM UE	486 CR 972 GPA 2.9	51	51		111							
MEMORANDA:													
03-16-2000 Ineligible-failure to meet scholastic requirements.													
03-28-2000 Reinstated.													
OPTION ADVISER: K. Libbrecht													
FRESHMAN ADVISER: A. Lange													
TRANSCRIPTS ISSUED:													
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SINGH, JAIDEEP													
1ST TERM 1998-99													
*L	165A	RUSSIAN LIT TRANSLATION	9	9	P	0							
*SE	157	SCI IN AMER, 1865-PRESEN	9	9	B	27							
PH	C9EA	QUANTUM PHYSICS	9	9	C	18							
PH	129A	MATH METHODS PHYSICS	9	9	B	27							
**	CUM UE	306 CR 540 GPA 3.0	36	36		72							
SINGH, JAIDEEP													
2ND TERM 1998-99													
*L	165B	RUSSIAN LIT TRANSLATION	9	9	C	0							
LAW	133	TELECOMMUN REGULATION	9	9	D+	12							
PH	C9EB	QUANTUM PHYSICS	9	9	C	18							
PH	129B	MATH METHODS PHYSICS	9	9	D+	12							
**	CUM UE	333 CR 580 GPA 2.8	26	27		42							
SINGH, JAIDEEP													
3RD TERM 1998-99													
ART	118	MODERN ART	9	9	P	0							
EC	011	INTRO TO ECONOMICS	9	9	B-	24							
PH	C9BC	QUANTUM PHYSICS	9	9	B	27							
PH	106C	TOPS IN CLASSICAL PHYSIC	9	9	C-	15							
**	CUM UE	369 CR 645 GPA 2.7	36	36		63							
Singh, Jaideep													
1st TERM 1999-2000													
BEM101		Introduction To Accounting	9	9	A+	39							
Ph 076A		Atomic/Laser Physics Laboratory	9	9	B+	30							
Ph 078A		Senior Thesis Experimental	9	9	A+	39							
Ph 205A		Relativistic Quantum Mechanics	9	0	F	0							
**	CUM UE	396 CR 753 GPA 2.9	36	27		108							
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Ch 003A		Fundamental Techniques Of Experimental Chemistry	3	3	P	0							
PE 084B		Table Tennis, Beginning, Intermediate, And Advanced	3	3	P	0							
Ph 070		Oral Presentation	9	9	B-	24							
Ph 077A		Advanced Physics Laboratory	9	9	A+	39							
Ph 078B		Senior Thesis Experimental	9	9	A-	33							
SESH 169		Selected Topics In Science, Ethics, And Society	9	9	A-	33							
**	CUM UE	435 CR 849 GPA 2.9	39	39		63							
Singh, Jaideep													
3rd TERM 1999-2000													
APH077C		Laboratory In Applied Physics	9	9	C-	15							
LLR 162		Spanish And Latin American Literature In Translation	9	9	C-	15							
Law 133		Topics In Anglo-American Law	9	9	C+	21							
PE 001C		Student Designed Fitness	3	3	P	0							
PE 070C		Weight Training, Beginning/Intermediate	3	3	P	0							
Ph 078C		Senior Thesis Experimental	9	9	A+	39							
Ph 103B		Topics In Contemporary Physics	9	9	C+	21							
**	CUM UE	486 CR 840 GPA 2.9	51	51		111							
MEMORANDA:													
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**0 for 10 for grad school applications**

# My Credentials

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PH	C9EA	QUANTUM PHYSICS	9	9	C	18							
PH	129A	MATH METHODS PHYSICS	9	9	B	27							
**	CUM UE	306 CR 540 GPA 3.0	36	36		72							
SINGH, JAIDEEP													
2ND TERM 1998-99													
*L	165B	RUSSIAN LIT TRANSLATION	9	9	C	0							
LAW	133	TELECOMMUN REGULATION	9	9	D+	12							
PH	C9EB	QUANTUM PHYSICS	9	9	C	18							
PH	129B	MATH METHODS PHYSICS	9	9	D+	12							
**	CUM UE	333 CR 582 GPA 2.8	26	27		42							
SINGH, JAIDEEP													
3RD TERM 1998-99													
ART	118	MODERN ART	9	9	P	0							
EC	011	INTRO TO ECONOMICS	9	9	B-	24							
PH	09BC	QUANTUM PHYSICS	9	9	B-	24							
PH	106C	TOPS IN CLASSICAL PHYSIC	9	9	C-	15							
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Ph 070		Oral Presentation	9	9	B-	24							
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PE 001C		Student Designed Fitness	3	3	P	0							
PE 070C		Weight Training, Beginning/Intermediate	3	3	P	0							
Ph 078C		Senior Thesis Experimental	9	9	A+	39							
Ph 103B		Topics In Contemporary Physics	9	9	C+	21							
**	CUM UE	486 CR 960 GPA 2.9	51	51		111							
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**Failure is a Gift.**

# Disclaimers

(\* ) A lot of this talk uses examples from physics, but I believe that *the most important points are universal*.

(\* ) The *opinions* I've formed on these matters are derived from my experience, conversations with friends, mentors, colleagues, and stuff I've read from books & internets.

(\* ) If you find something useful, *then take it & share it!* Otherwise, feel free to ignore it.

(\* ) My plan is to be intentionally provocative in order to make you think about your career!

# Should I Apply to Graduate School?

**Yes, if and only if:**

- 1. you want a career in research (scientific or otherwise):**
  - research inside & outside of academia **requires a Ph.D.**
  - **academic research** gives you the freedom to study what you want provided you can **obtain your own funding**
  - **industrial research** provides plenty of funding provided you work on exactly **what the company wants**
- 2. you are willing to take 1 to 3 more years of classes**
- 3. you are willing to spend 3 to 8 years learning the practice & craft of scientific research at ~\$15/hour: grad school is not school, it is a scientific apprenticeship**

**NO-if you are only applying to “hit the snooze button on life” (i.e. not ready to make a commitment to the process).**

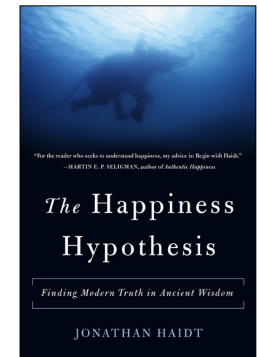
# Why Choose Scientific Research?

Because it makes you happy (=satisfaction)

Haidt's Formula for Happiness ( $H$ ):

$$H = S + C + V$$

Haidt, Jonathan, *The Happiness Hypothesis: Finding Modern Truth in Ancient Wisdom*, Basic Books: New York (2006).



$S$	biological Set point	40%	no direct control	genetic factors, brain chemistry, etc.
$C$	living Conditions	10%	some control	race, gender, wealth, number of fingers, length of commute, fame, city, etc.
$V$	Voluntary activities	50%	total control	time spent with family / friends, hobbies, exercise, <b>your "calling"</b>

# Why Choose Scientific Research?

job  $\leq$  career  $\leq$  “calling”

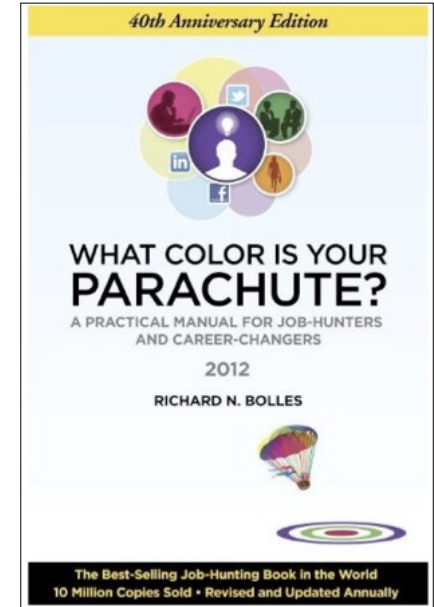
What is your “calling”?

*start by working out the exercises in:*



**Dyson, Freeman, Science as a Craft Industry, Science**  
15 May 1998: Vol. 280 no. 5366 pp. 1014-1015

**Bolles, Richard N., What color is your parachute?**  
(2012 Edition) Ten Speed Press: Berkeley, CA  
(2012)



If Science is your “calling” in life: **Easy, go for it!**

*Good news: You are very unlikely to become a professor (just based on statistics)*

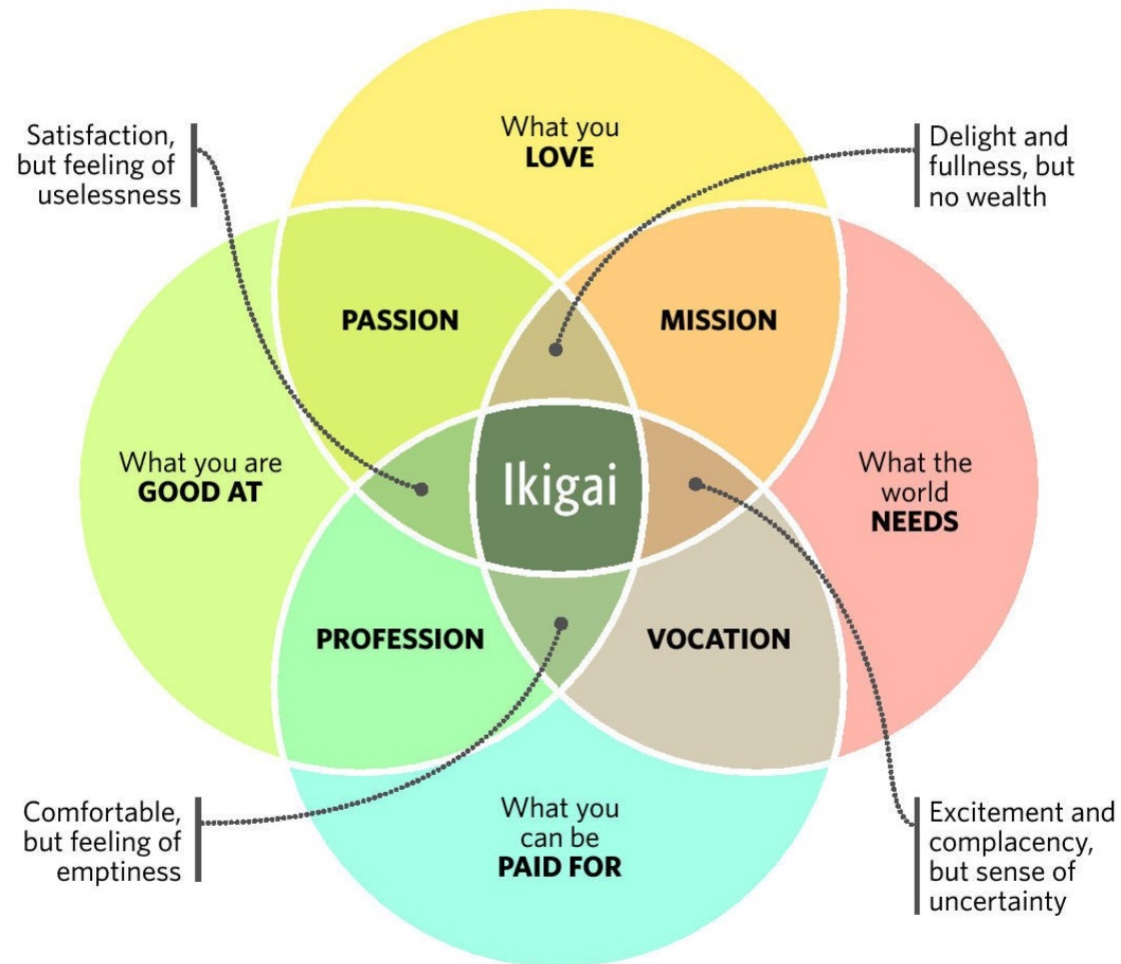
*If Science if not your “calling” (don't worry, no big deal, then...)*

*Great news: A graduate degree makes your lifetime-averaged unemployment rate less than 0.1% and nearly guarantees you “enough” salary w/benefits to live comfortably...*

# Why Choose Scientific Research? At Least Two...

## Ikigai

A JAPANESE CONCEPT MEANING "A REASON FOR BEING"



SOURCE: dreamstime

TORONTO STAR GRAPHIC

Image: Toronto Star

# How should I decide which programs to apply to?

What stuff do you find cool?

Which of these things do you want to find out more about?

What field of science is related to this?

What are the recently solved problems in this field?

What are the unsolved problems?

How are these problems being approached?

Which groups are attacking these problems?

What else are these groups doing?

Which project seems the most interesting to you?

Specific

General

- go to colloquia or seminars
- read papers (physics.aps.org or astrobit.es)
- study group websites
- contact the PI for a chat

# How should I contact groups that I am interested in?

- 1. Don't waste their time! Do your homework beforehand!**
2. Read their CV, website, some of their papers
3. Send email, say who you are, thinking about applying to grad school, learn more about their work, mention that you've already had a look at some of their papers
4. Ask if you can chat over the Zoom (or meet at conference if applicable)
- 5. Ask for no more than 30 minutes of their time.**
6. Be patient and polite, faculty are very busy! **Contact students/postdocs instead if no response from PI.**
7. Keep conversation focused on learning about the research
8. Are there are new projects that are going to be starting up in the next couple of years?
9. Does this person have a passion for their work?
10. Thank them for their time (also via email afterwards)

**The goal** is to find out if **their research** is something that **you** want to participate in.

# What are the parts of the grad school application?

1. General biographical information
- 2. List of faculty members that may be interested working with**
3. Financial aid information
- 4. Personal statement**
- 5. Academic statement**
6. Academic record (transcripts, grades, etc.)
7. Test scores (general GRE, **subject GRE**, TOEFEL, etc.)
8. Curriculum Vitae (employment history, education history, activities, etc.)
- 9. Three letters of recommendation**
- 10. Graduate application fee or fee waiver (~\$75 per school)**

# How do I request letters of recommendation?

0. **Early** and often!
1. **Research advisors** are the best choice for letter writers
2. Course instructors are also good (**physics courses** are best, but others are ok as well)
3. Give your letter writers:
  - an out – ask them if they have **the time** to write a **strong** letter
  - **at least 6 weeks** to write the letter
  - something to write 1-2 pages about you (**get to know them**)
  - lots of clear guidance (spreadsheets with **due dates**)
  - lots of **background information** about your long-term career goals

See my blog post of June 6, 2018 ([spinlab.me](https://spinlab.me)) for more guidance:

<https://spinlab.me/2018/06/06/the-time-consuming-privilege-of-writing-a-thoughtful-letter-of-recommendation-for-a-student-2018-edition/>

# What do I write about for my statements?

## “Personal” – one page 12 pt maximum

- **context** about your relevant activities like leadership experiences
- **context** about your academic record if there are **gaps or down periods**
- **context** about your **life situation** (first to go to college / grad school etc.)
- **context** about you would support a diverse and inclusive society
- **context** about **obstacles that you've had to overcome** to get to this point
- this can be a **generic** statement for each school

## “Research” – one page 12 pt maximum

- which **subfield** do you want to work in and why?
- experimental, theoretical, computational, or accelerator-based research?
- **why this school in particular? (good to name potential groups/PIs)**
- **context** about **research experiences** (when, where, what, how, why, who)
- **context** about **specific accomplishments** and / or awards
- this must be **highly tuned** to each school

# Should I take the Physics GRE?

**Yes**, only if it is **absolutely required** by a particular school. Make sure that it is not optional – **check** with the grad program administrator via email – **do not believe the website** which may not have been updated in years! Consider **not even applying** to schools that really require it – this is bullshit.

Otherwise, **NO** – it is a **waste of time and money** (\$150/attempt + \$27 per report to school after the first 4 schools) and **is not correlated** with successfully completing a Ph.D. program. We've known about this absurdity **since I was in high school** and the **Physics GRE** is very slowly and painfully being **phased out**.

# What should I do during the grad school visit?

1. **Do your homework! Do not waste people's time!**
2. Contact the groups that you are thinking about joining **before the visit!**  
**Ask** the grad program administrator to meet them!
3. **Talk to current/former students of the group** – are they happy? Do they understand the big picture behind their work?
4. Find out the **current positions** of former postdocs and students from the group.
5. Find out what **lab culture/reputation** is like from other students both within and **outside the group**.
6. Explore the city and surrounding area if possible – **do you want to live there?**
7. **Find out about upcoming summer research opportunities!**

# What is the timeline for the application process?

- **May-August:** research information about potential research groups, contact group PI or current members, make a list of 5 to 10 schools, create CV
- **September:** download application materials, **contact letter writers**, draft personal and research statements, update CV
- **October:** **send requested materials to letter writers**, revise personal and research statements
- **November:** final revision of personal and research statements, request transcripts and test scores, **follow up with letter writers as a gentle reminder and see if they need any additional information**
- **December/January:** **submit application package at least 2 weeks before the deadline**, follow up with grad program administrator to make sure application package is complete and was received
- **January/February:** offer letters sent
- **February/March:** grad school visits
- **April:** accept an offer and **politely decline others**

# How much is the total cost out of pocket cost for me from application to matriculation?

average Big 10 graduate application fee = **\$75/school**

GRE subject test fee = **\$150/attempt**

GRE additional score report fee = **\$27/school (first 4 are free)**

Moving expenses = **\$1000 (varies wildly depending on circumstances)**

**10 schools with 2 GRE attempts and move > \$2000 (300 hrs @ minimum wage)**

Some suggestions:

- apply for **fee waivers** for graduate school application fees. (Big 10 – “Free App”)
- **avoid programs** that require the Physics GRE
- apply for **GRE Fee Reduction Program** if necessary
- **find out if you can have a paid position to work remotely over the summer for one of the research groups that you are interested in**

**Email me if the financial barrier to applying to grad school is too high! We can chat about strategies.**

# What are some insights from the admissions committee perspective?

- Admissions committee members like **known quantities** (i.e. letters from professional colleagues, applicants that are former REU students, etc.)
- **Apply early** so that you are eligible for university scholarships and fellowships – these nominations to university-wide competitions are typically due very early in the admissions process
- Be exceedingly nice, polite, and grateful to the **grad program administrators**, they have lots of power to help you
- Keep your letter writers **in the loop** about your status, they can sometimes influence things behind the scenes
- **Be honest** about your intentions especially if your plans change
- **Do not “ghost” anyone** – you may have to interact with them in the future
- Give the committee **“weapons”** in order to advocate on your behalf
- Find out if there are any upcoming openings in the groups that you are interested in: **(number of offers) = (number of expected slots based on funding)/matriculation rate**
- **Try to make contact** – useful even if the PI does not respond

# Hope for the best, plan for the worst

1. Only apply to schools that you would **actually attend**.
2. Make sure each department has **2 to 4 groups** that you would be willing to work for.
3. Ask for an **honest assessment** about your application from a faculty member on your own home institution's graduate admissions committee.
4. If you don't get in:
  - have a **backup plan** in place beforehand
  - find out your weaknesses and strengthen them
  - see if one of the groups that you are interested in is willing to take you on for a year in a "lab tech" capacity

# Probability of Success – Good Luck!

You can control some of these...

but not this...

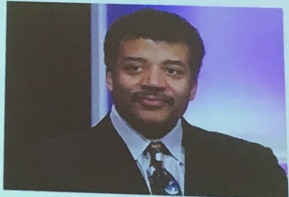
...the good news is that it just needs to be **not identically zero**.

**Success in Graduate School**

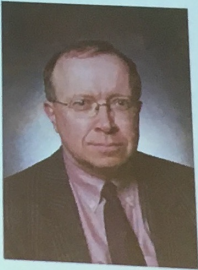
Rate yourself on 5 questions:

- a) How smart are you?
- b) How hard do you work?
- c) How good are your social skills?
- d) How ambitious are you?
- e) How lucky are you?

Probability of success =  $a \cdot b \cdot c \cdot d \cdot e$



Neil deGrasse Tyson



Scott Tremaine

Department of Energy Office of Science

**Michael Thoennesen (formerly of MSU)  
Distinguished University Prof./APS Editor-In-Chief)**

# Ask Me Anything!

**(will not be  
recorded)**