

Good Choices for Great Careers in the Mathematical Sciences

Mac Hyman

Los Alamos National Laboratory

Scientists with Great Careers
identified and worked
on the Right Problem (Passion)
in the Right Way (Talent) and
in the Right Place and Time
(Engaging Environment)

Passion

Every scientist I have ever known with a great career is passionate about what they are doing.

What are you deeply passionate about?

Do you want to make the world a better place, understand mathematics, physics, or biology, teach others, create beauty, ...

What are you doing when you are so happy that your smile is pushing your ears back and your heart sings?

If you could do anything for the next ten years, what would it be?

Deep emotional commitment is necessary for great success.

You need more than raw talent to have a great career, you must have passion for what you are doing.

Passion



En Zambie et au Nigeria,
plus de 90% de la population vit avec moins de 2 \$ par jour ...

**We are fortunate to be able to
seek out and follow our passion.**



**A lot of people in the world
have to be focused on survival.**

Population sous le seuil
de 2 \$ par jour à la fin des
années 90 (en %) :

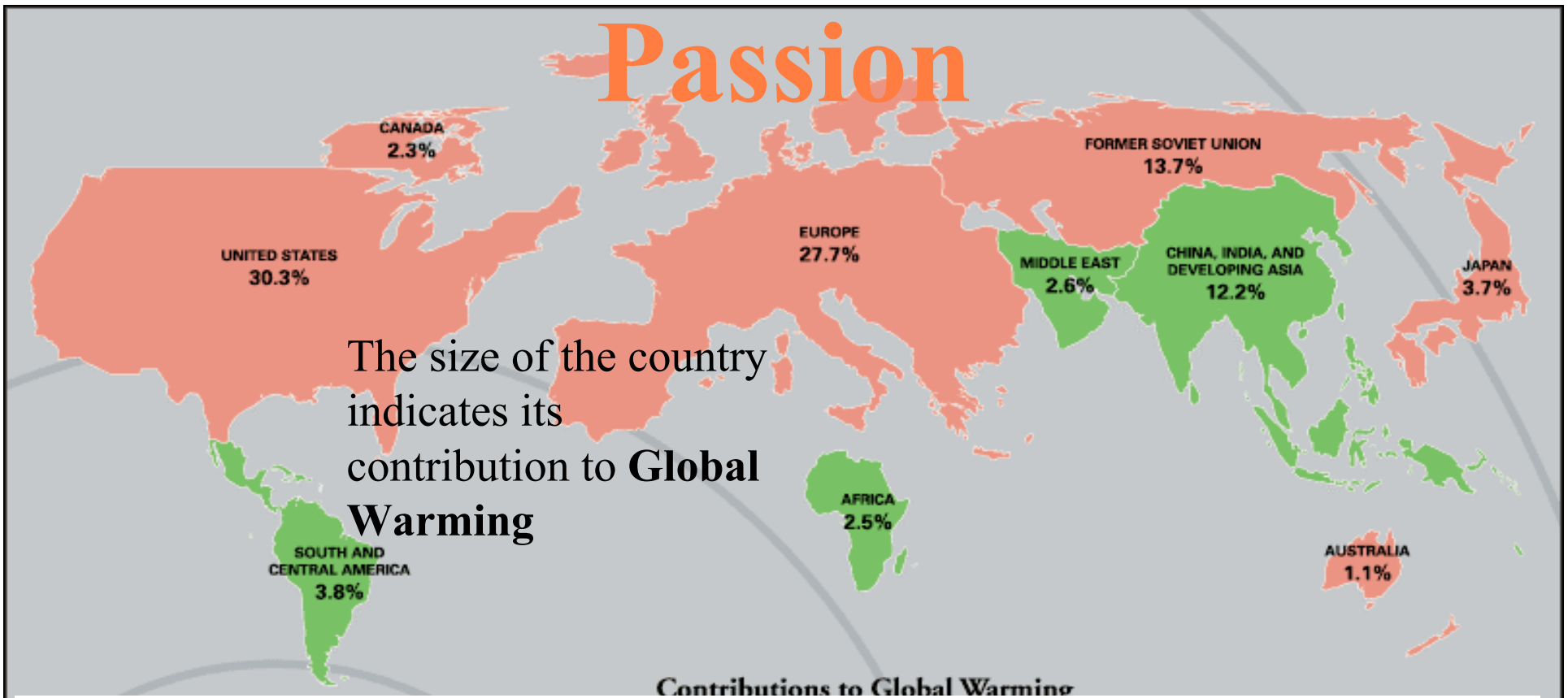


Donnée manquante



**Don't underestimate the importance of science in fighting hunger,
poverty, or promoting human rights.**

Passion



We are at the very beginning of time for the human race.

There are 10s of thousands of years in our future.

Do you feel a responsibility to do what you can to protect the earth and preserve it for future generations of mankind?

Are you deeply passionate about the environment?

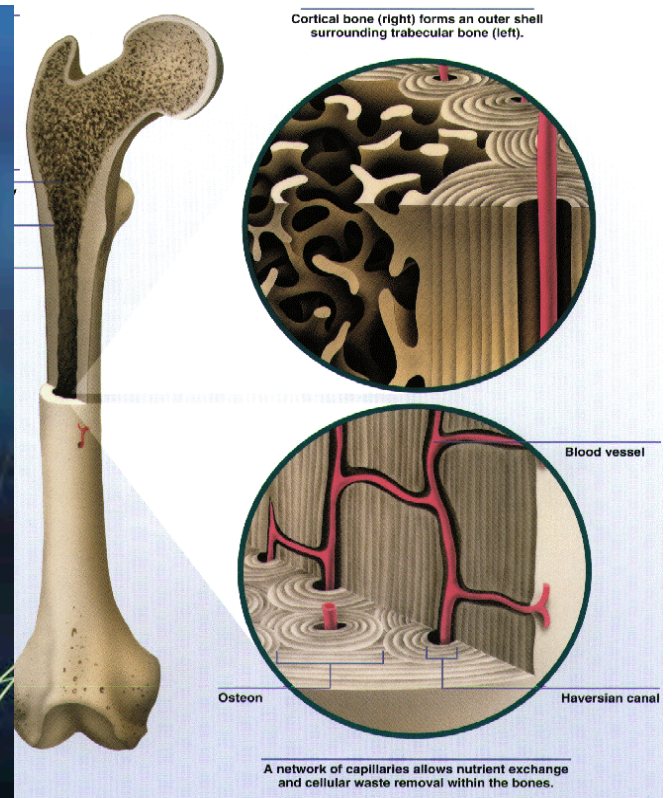
<http://www.wri.org/>

202-729-7600

Map by Equator Graphics, Inc.

W R I

Passion



Are you deeply passionate about healthcare or medicine?

Passion

This news story changed my life.

The Gay Epidemic

16 December 1982 • New Scientist News • Richard Fisher

Between spring 1981 and August 1982, physicians in the US diagnosed 500 Americans with "acquired immunodeficiency syndrome" (AIDS).

At least 175 of these people have since died. Of those who had developed AIDS in 1980, 70 per cent are now dead. Two cases were reported in England in 1982 and both died. Six similar instances occurred in Denmark. Two died and two are still in hospital.

Are you deeply passionate about healthcare or medicine?

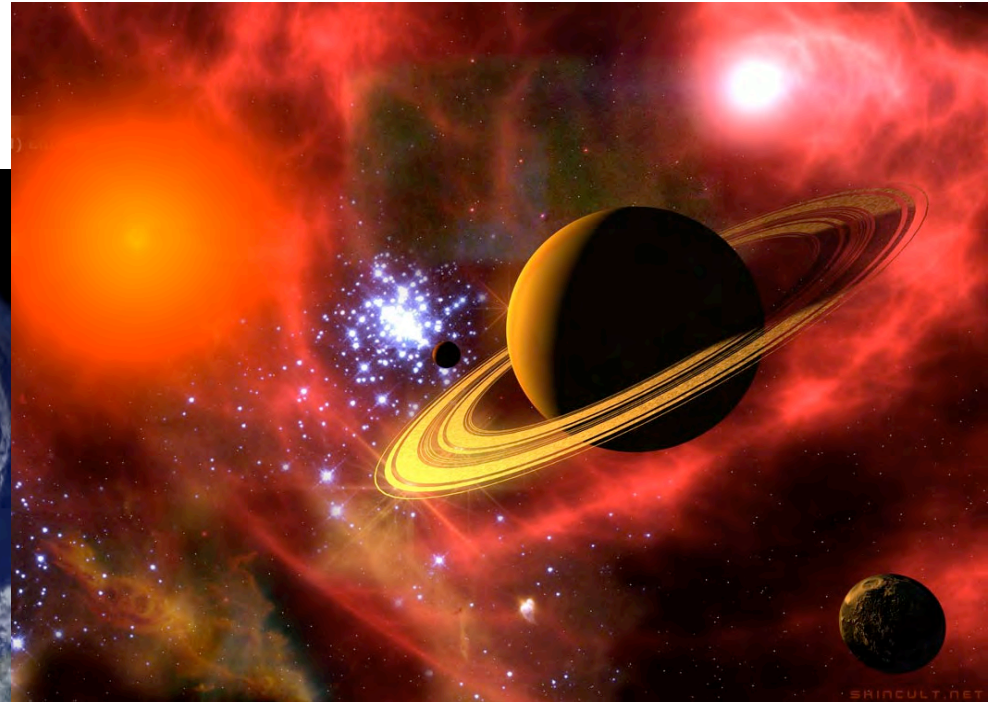
Passion



Passion isn't dictated, it's discovered.

Are you deeply passionate about preserving natural resources?

Passion



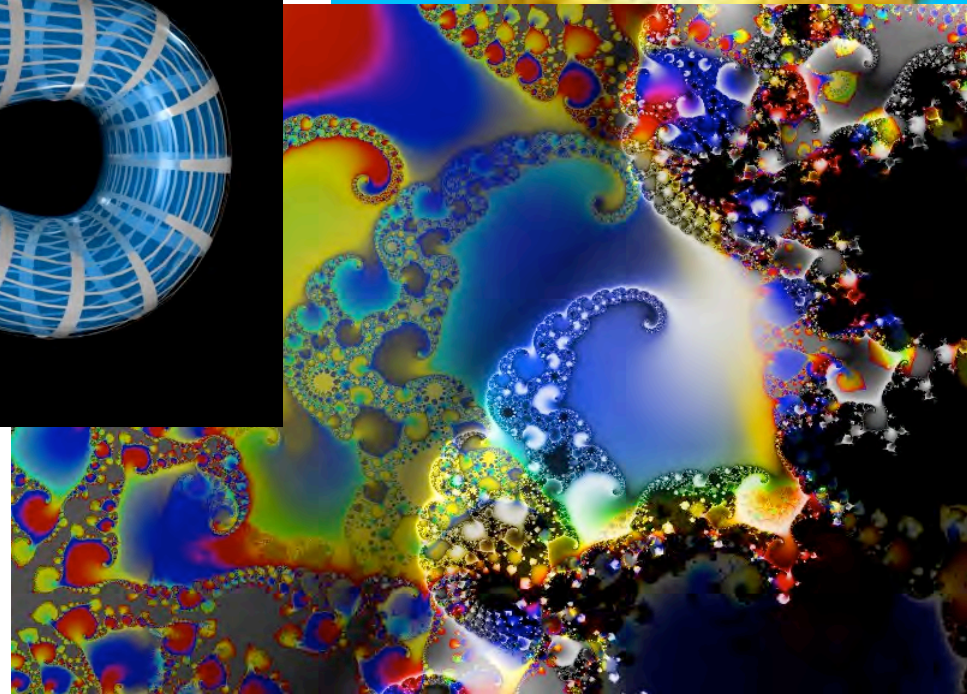
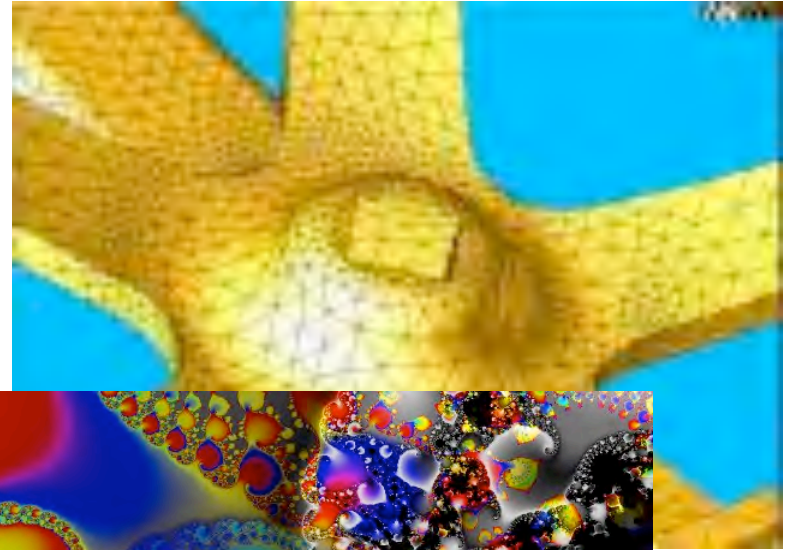
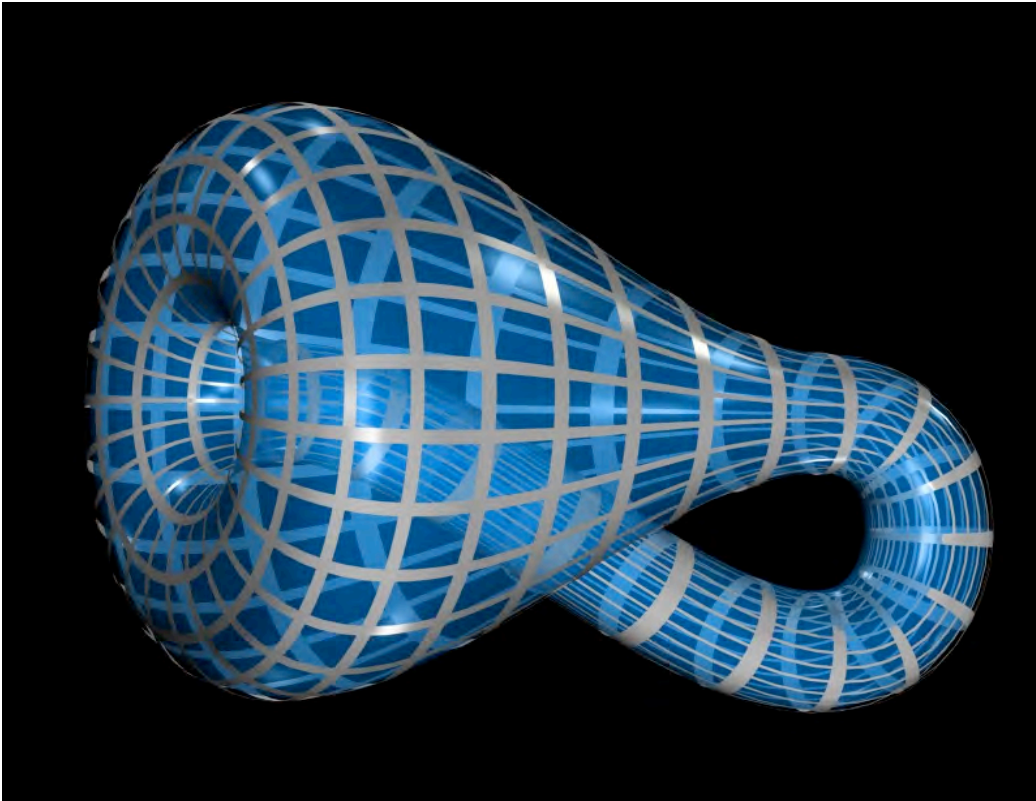
Are you deeply passionate about understanding the universe?

Passion



Are you deeply passionate about teaching?

Passion



Are you deeply passionate about mathematics,
the search for beauty, or the joy of discovery?

Passion

COSMOLOGY MARCHES ON



Scientists are driven to
understand, understand, understand.

Passion

People with great careers follow their passion everywhere.

It would be crazy not to follow your heart and spend part of every day becoming **the** expert in something you are passionate about.

Stretch yourself: take courses, read books, watch videos, listen to audio books, and seek out people to share your love.

If you ask people with great careers why they work so hard, they look at you like your asking a dumb question. *“Why wouldn’t you want to know everything about what you are passionate about?”*

Identify your passion and follow your heart. Just do it!

**Why wouldn't you
want to become the
best in the world
about something you
are most passionate
about?**

the rest of your life?

**If you pursue goals that move you,
then you cannot squander your life.**

Your happiness is under your control.

Saving lives
Fight Hunger and Poverty
Intrinsic Beauty of Nature
Medicine, Physiology
Psychology
Fundamental Truth, theorems
Understanding^{^3}
Physics
Biology
Chemistry
Geosciences
etc. etc. etc.
Environment
Renewable energy
Water Resource management
Weather, climate
Music
Computers
Art, Beauty, Writing
.....

Talent

A Great Career will be almost impossible if you aren't passionate about what you do, but **passion alone is not enough.**

Great Careers are build on a person's strengths, and **strengths can be great if they are build on a talent.**

A talent is a recurring trait that you do naturally.

We all are talented. Our talent might express itself as a knack for solving puzzles, computer coding, remembering names, identifying hidden patterns, lateral thinking, or in other everyday activities.

Your talent is the foundation for your strength.

Is there something that you seem to do effortlessly that other struggle with? If so, then chances this is one of your talents.

Talent



Tiger Woods, Jay Leno, and Bill Gates seem to be blessed with rare and special talents.

Others may know the same facts and have the same expertise but never have a great of a career.

They have great careers because they built their talent into a strength

A Talent becomes a **Strength** through Knowledge, Skills, and Expertise

First identify a strength that benefits from your talent

Knowledge: Take courses, read books, watch videos, TV specials, listen to audio books, and seek out experts to create a solid foundation for your talent.

Skills: Use your knowledge to develop skills that stretch your breadth of knowledge and extend your depth of understanding to skillfully apply your talent.

Expertise: Nurture your talent by gaining expertise in applying the skills that you excel in.

Building your strength based on your talents is a key to becoming the best in the world on something you are passionate about.

Strength = Talent + Skill + Knowledge + Expertise

Talent is a recurring natural trait.

People don't change that much.

Don't waste time trying to put in what was left out.

Try to draw out what put in.

That is hard enough.

The educational system can help us identify our talents.

1. In K-12, students fill in the holes
2. As an undergrad, they begin to focus (major)
3. In a masters program, they fill solidify their base.
4. PhD research is focused on developing **Talents** into

Talents become **Strengths** through **Knowledge**, **Skills**, and **Expertise**

Stop trying to fix your all your weaknesses. You can become competent, but not great unless you build your career based on your talents.

Your **Talent** is like a Balloon.
Your **Skills, Knowledge, and Expertise** are fuel.



Identify any anchors that hold back your talent. These can be a lack of skill or knowledge outside your passion, such as communication skills, writing or speaking ability, or even just explaining your ideas.

$$\text{Strength} = \text{Talent} + \text{Skill} + \text{Knowledge} + \text{Expertise} - \text{Anchors}$$

Nontalents can be **anchors** that can hold down your career

- **Mitigate** the anchor by using a crutch or other means to get you by.
- **Partner** with another person who's strengths are your nontalents.
- **Acquire** knowledge, skills, and expertise to get by so that your nontalents are not anchors that you back.

Talent is not enough



We all have nontalents. There are 3 ways to mitigate these anchors:

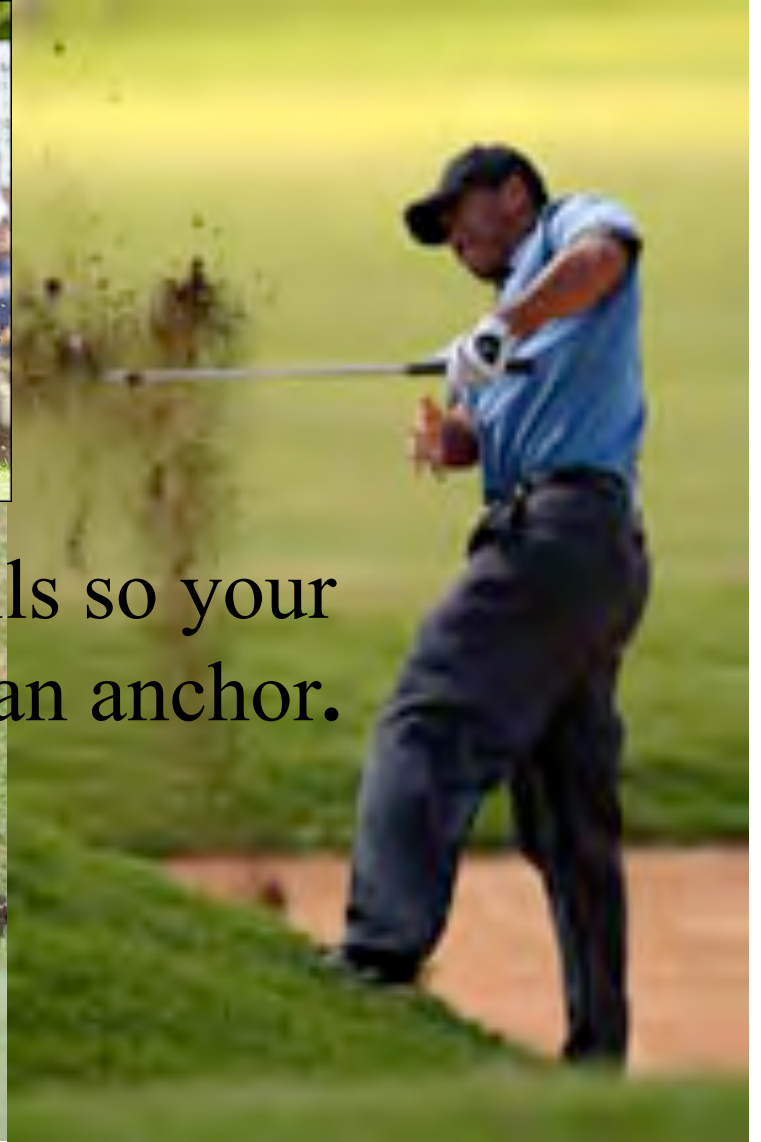
1. **Mitigate:** use a crutch or other aid
2. **Partner** with someone who has a strength to fill the gap
3. **Acquire** the skills so your lack of talent doesn't hold you back

Talent



Microsoft Corporation, 1978

Talent



Acquire the skills so your nontalent is not an anchor.



When you identify an anchor holding back your talent, you can fix it or work with someone who's strength is your weakness.



Everyone's talents are different.



It is up to you to figure out your talents and to know what you can and cannot change.



**Become more and more of who you already are,
build on your strengths, and mitigate your anchors**

Strength = Talent + Knowledge + Skills + Expertise - Anchors

Greatness requires you **base your career on your strength**, and that your **strengths are based on a foundation of your talents**.


Focus on, develop, and nurture your talent into a strength. **Don't try and put in what was left out; strengthen what was put in.**

The remarkable thing is that people with great careers have just as many limitations as the rest of us do, but they don't let their nontalents hold them back.

Mitigate, partner, or acquire the skills to keep nontalents from being an anchor holding you back.

Talents include:

Connecting abstract models
with physical systems
Computer programming
Communication talents
Problem solving
Lateral thinking
Seeing hidden patterns
Organizing ideas
Striving through difficult times
Synthesizing diverse facts
Working with people
Energizing team members
Focusing in difficult situations
Empathy
Strategic thinking
Organizing Complex Systems


$$\text{Strength} = \text{Talent} + \text{Knowledge} + \text{Skills} + \text{Expertise} - \text{Anchors}$$

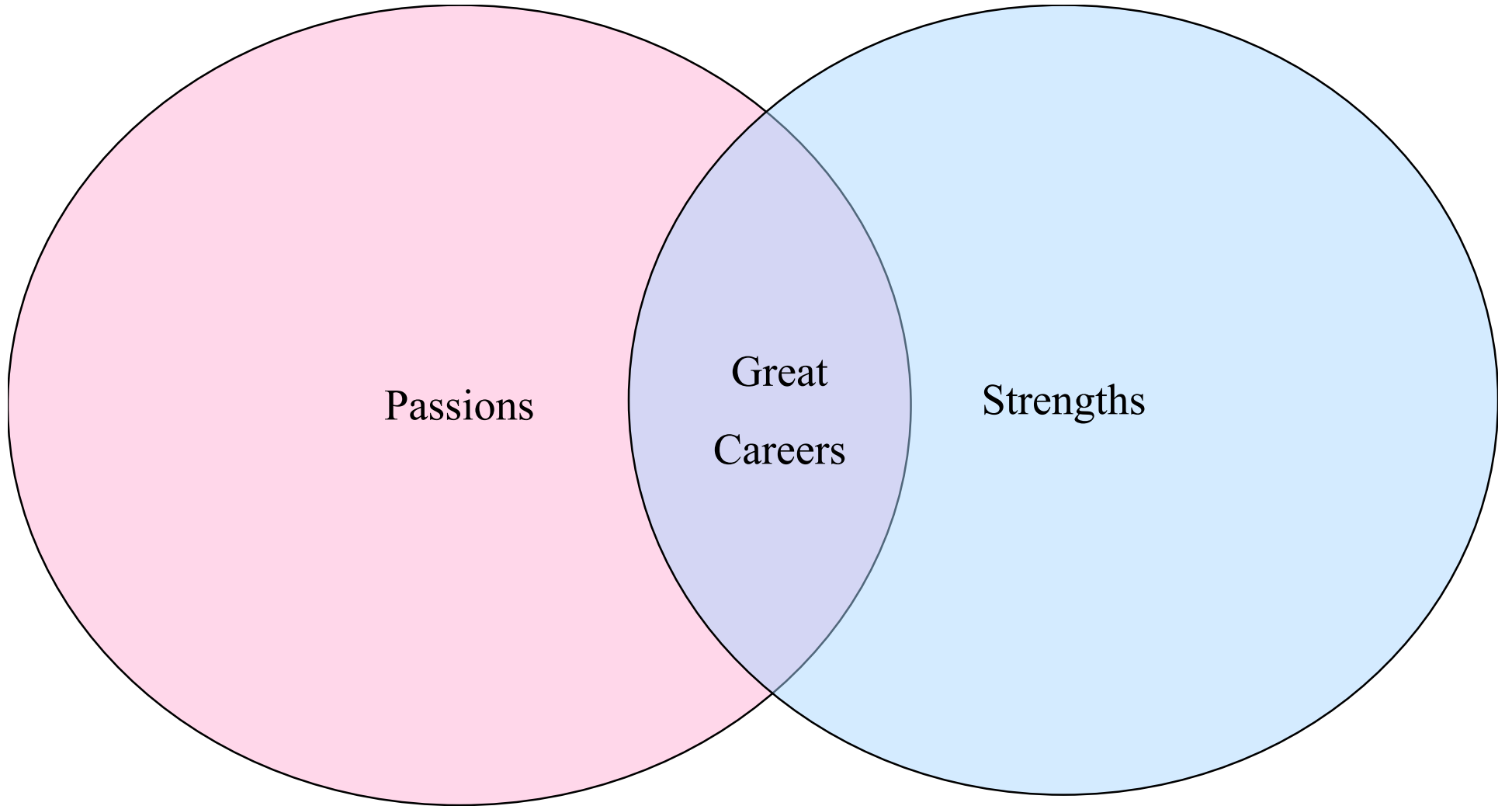
Nontalents (anchors) for Scientists: communication skills, time management

Talent

$$\delta \int dS = - \int H \delta \vec{x} \cdot \vec{n} dS$$

$$\nabla \cdot \vec{n} = -H$$

A talent will not be a strength unless it is applied in a situation you are passionate about.



Engaging Environment

People are not the greatest asset in shaping your career,
the right people are.

The right people will succeed in whatever they do.
(although you might not be able to predict what they will succeed at ahead of time.)

The wrong people will never succeed, no matter what they do.

First Who...Then What in picking classes, schools, and jobs.

First identify an environment where others will support your passions and talents, **then** join them to decide on what to do.

First Who (the right people) ...

Then What (which job or class to take)



Character is more important than expertise, reputation, or expertise.

Sir Isaac Newton would have discovered gravity years earlier had he not worked in the same place as William Tell.

Working with the right people will be your most important asset.

Count on missed opportunities if you work around the wrong people

Engaging Environment

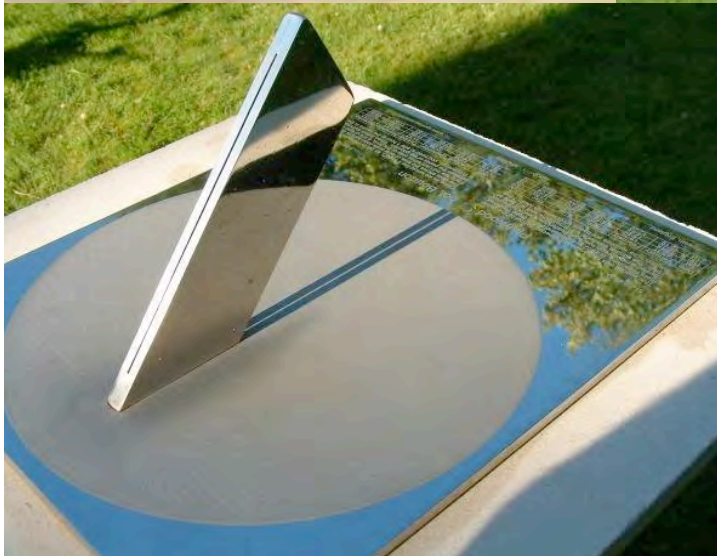
The right places set their students and colleagues up for success by establishing a culture of discipline built around commitments to core values, with freedom and an ethic of entrepreneurship about how to meet those promises.

Strive to work in a Culture of Discipline with a rigorous, but not ruthless, culture where people share your work ethic and desires.

Seek out clock builders, not time tellers who never stop trying to become qualified for the job.

Even clock builders must work in the right environment to be successful

**A genius at building sundials
will not receive recognition by
working in the shade.**





Create your own bus leading to a great career.

- **Get the right people on your bus,**
- **Get the wrong people off your bus, and**
- **Trust the people on the bus to decide where to go.**

Courant Institute “bus” mid 1970s

Students & Postdocs

Ami Harten

Andy Majda

Anito Mayo

Barbara Keyfitz

David Gottlieb

David Levermore

Eugene Trubowitz

Fern Hunt

Jeff McFadden

Greg Kriegsmann

Mac Hyman

Russ Caflisch

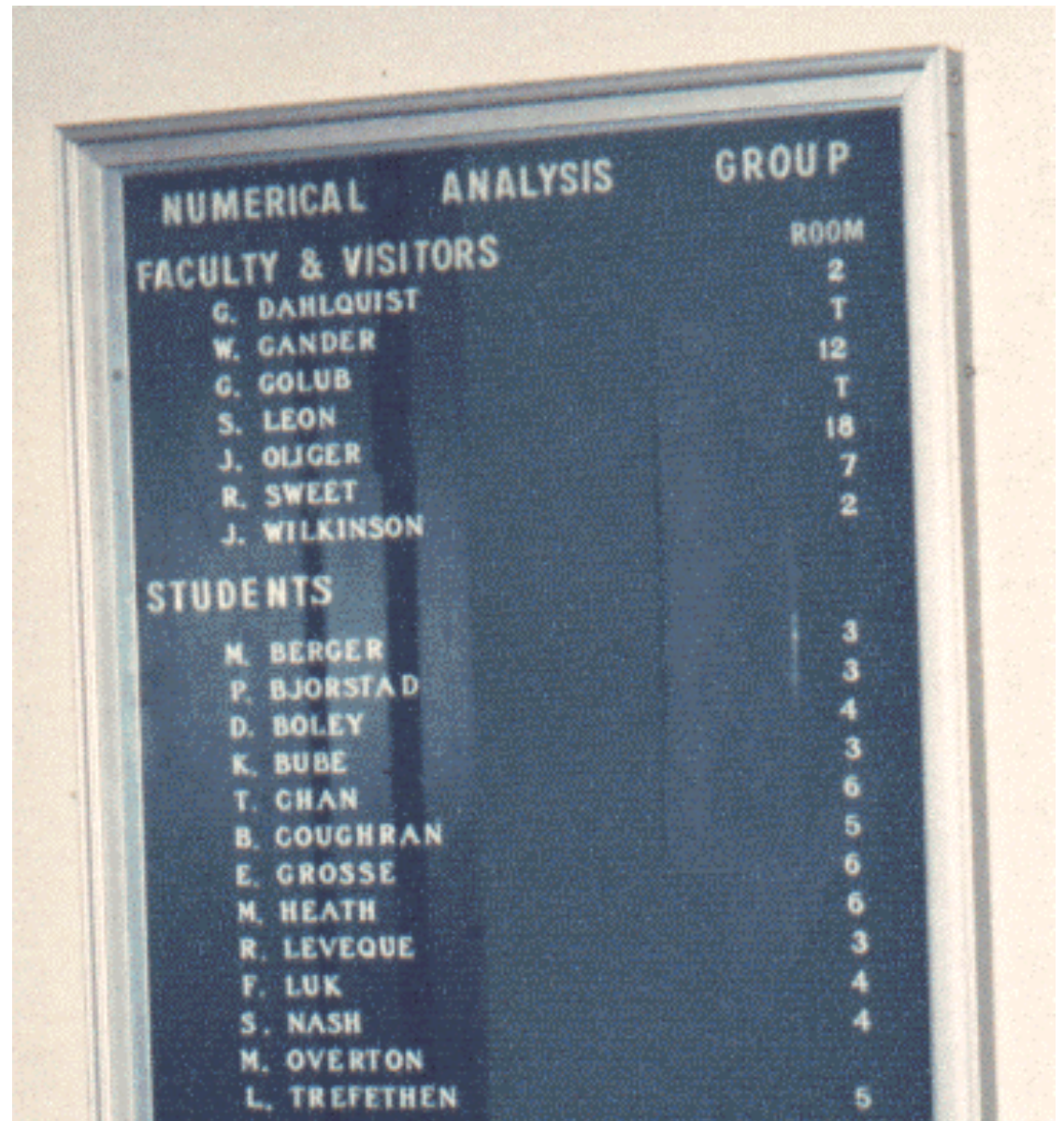
Stan Osher

Michael Taylor

Tom Beale

....

Stanford Serra House “bus” Numerical Analysis 1977-78



NUMERICAL ANALYSIS		GROUP
FACULTY & VISITORS		ROOM
G. DAHLQUIST		2
W. GANDER		T
G. GOLUB		12
S. LEON		T
J. OLIGER		18
R. SWEET		7
J. WILKINSON		2
STUDENTS		
M. BERGER		3
P. BJORSTAD		3
D. BOLEY		4
K. BUBE		3
T. CHAN		6
B. COUGHRAN		5
E. GROSSE		6
M. HEATH		6
R. LEVEQUE		3
F. LUK		4
S. NASH		4
M. OVERTON		
L. TREFETHEN		5

Stanford Serra House Numerical Analysis 1977-78

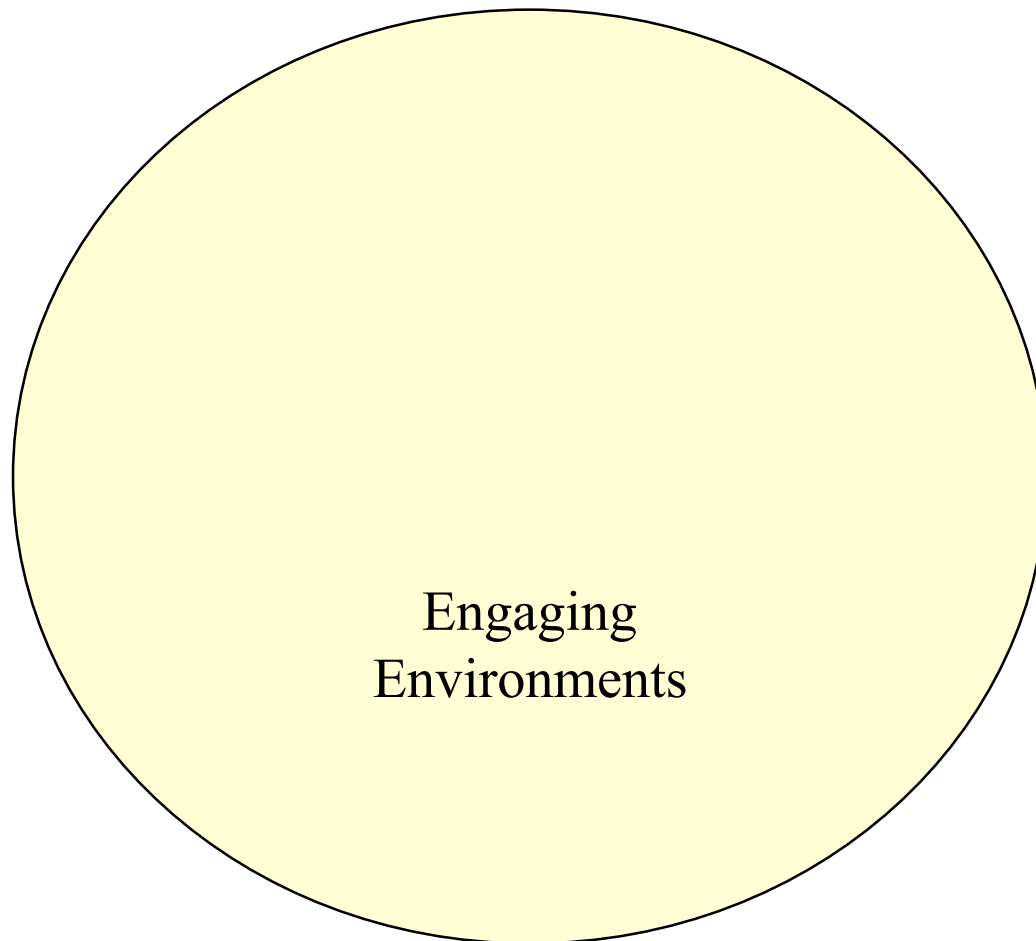


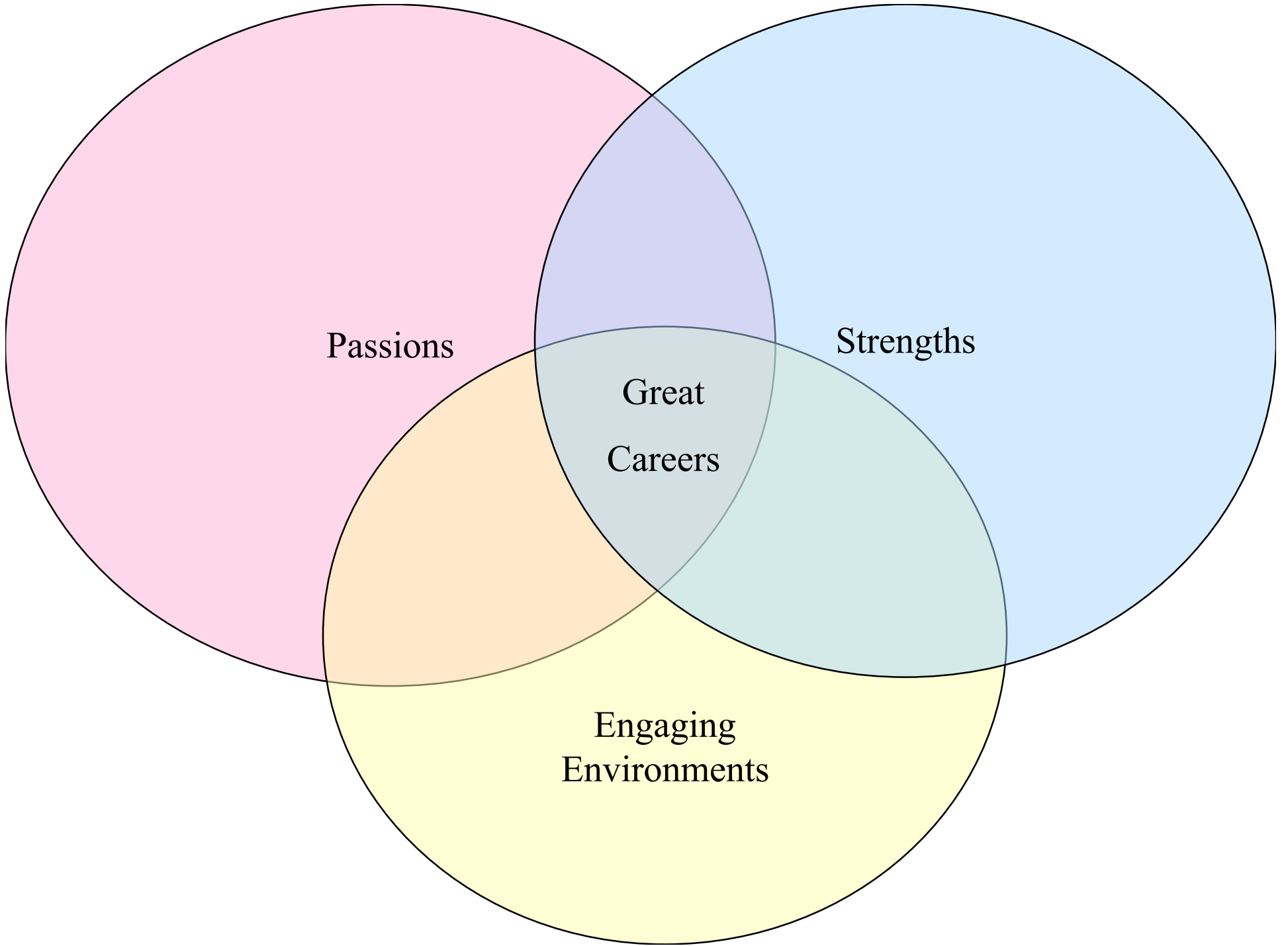
Serra House Bus 1977

**Randy LeVeque, Jim Wilkinson, Ken Bube, Gene Golub,
Bill Coughran, Walter Gander, Frank Luk, Eric Grosse,
Nick Trefethen, Steve Nash, Marsha Berger, Hakan
Ekblom, Petter Bjorstad, Steve Leon**

Established culture of discipline built around commitments to core values,
with freedom about how to meet those promises;

Find a support group of clock builders, not time tellers.
Be a team player working with the RIGHT people





Passions

Strengths

Great
Careers

Engaging
Environments

The Central Core Flywheel

Imagine your career in the central core of the three circles (**passion, talent, environment**) as a huge giant heavy flywheel.

Great careers are created by relentlessly pushing turn, upon turn, upon turn, moving it in the same direction, slowly building momentum, until breakthrough and beyond

The flywheel is a guide to help in making hard choices.

Your **passion** gives you the desire to persevere.

Your **strength** comes from your **talent** supported through knowledge, skills, and expertises.

Your **environment** provides your support group.

Setting Goals in Your Central Core

Reality: “**You can’t always get what you want.**” Mr. Jimmy
“**But if you try sometimes well you just might find, you get what you need**” Mick Jagger

Set your goals: A great career is defined by your **passion, strengths** (as determined by your talents), working in an **engaging environment**, and your career choices are guided by your values.

The central core flywheel analogy can help guide your choices. Paths are unique to the individual, you must find you own way.

A great career is not defined by your salary. Making a living is essential, but not the central point of a great career.

Still ... you do need to make a living.

The Job Market: Academia, Laboratories, and Industry

It is a wonderful goal to follow your passion, do what you are talented at, and work in an engaging environment.

In finding our path to a great career, we have to also recognize that we are human beings with human needs.

It is hard to be truly happy without

- having a secure, well-paid job,
- accomplishing your goals,
- seeing your family,
- having free time to enjoy life.

The Job Market:

Academia, Laboratories, and Industry

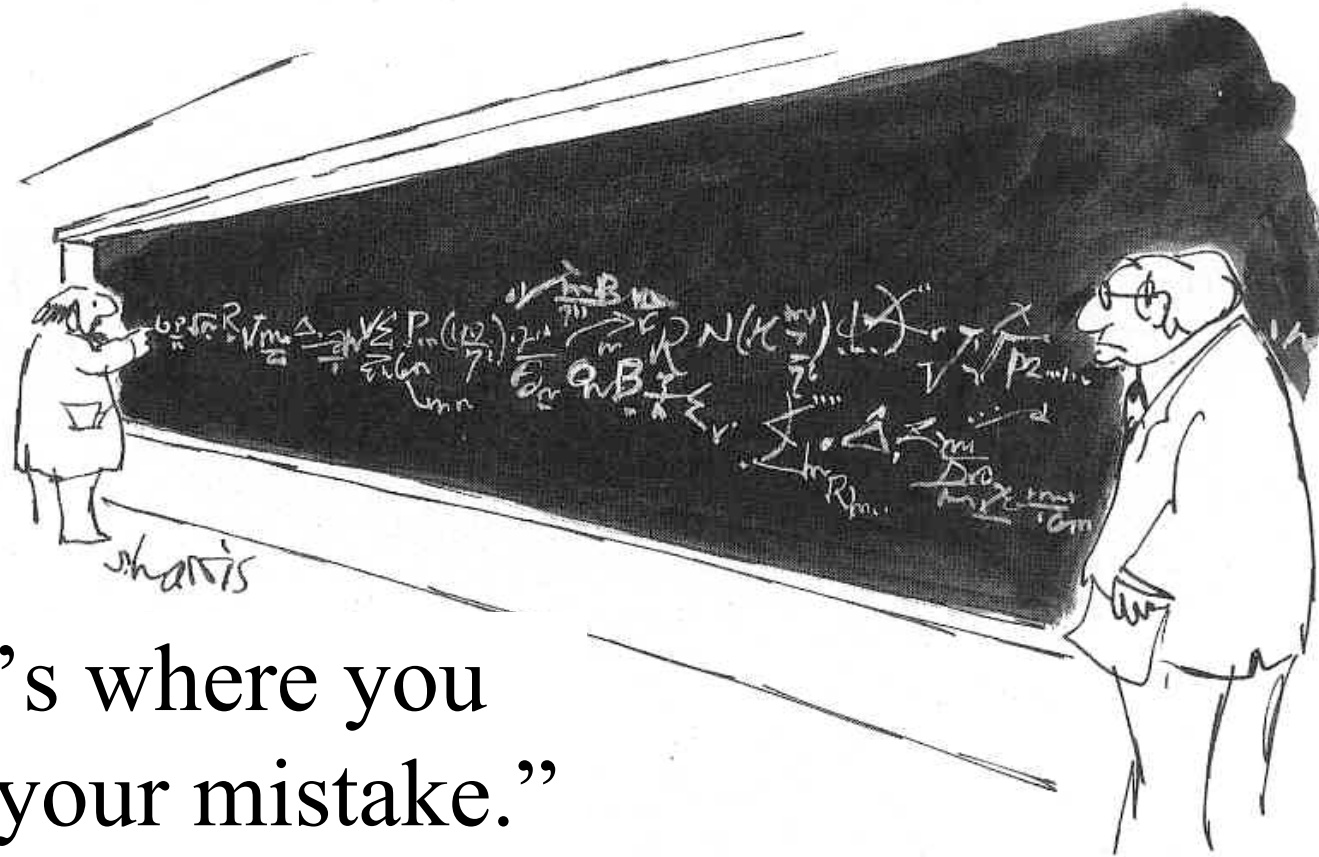
Academia: Natural to adopt role models of the people you encounter in your formative years. Tenure has security, minimal requirements (teaching), guaranteed paycheck. Down sides: the nine month salary, and it can be difficult to balance teaching and students, funding, management.

Laboratories and Industry: Job security is based on the recognition of your peers. Simple job description: scientific leadership, produce interesting results important to your employer, and make yourself useful.

Laboratories and Industry are managed environments:

Management suggestions aren't always bad. Michelangelo was asked by the pope to paint the Sistine Chapel. He didn't write a proposal to the 'Arts council of Rome.' **Application driven research can drive basic research.**

A Mistake Early in Your Career Can Take a Lifetime to Correct



“Here’s where you
made your mistake.”

A mistake at the beginning of a career can lead to a lifetime
of unfulfilled dreams. Stay flexible and focused.

Why Strive for a Great Career?

How can you imagine not living a life where you are:

- doing what you are most passionate about,
- strengthening and using your talents for a meaningful life,
- working with others who share your values and goals.

When all the pieces come together, not only does your career move toward greatness, but so does your life.

It is impossible to have a great life unless it is a meaningful life.

It is very difficult to have a meaningful life without doing meaningful work and living your life so that it matters.

Why Strive for a Great Career?

It is no harder to have a good career than a great career.

In a great careers you will have:

- More planning, but not more work
- More opportunities and satisfaction
- More fun

Why strive for a great career?

If you are engaged in work you love and care about, for whatever reason, the question needs no answer.

The question is not why, but how.

References:

Good to Great

by Jim Collins

First Break all the Rules

by Marcus Buckingham and Curt Coffman