

Career Renewal for Established Scientists

July 9, 2009

“But for many and perhaps most academic scientists – indeed, for most professionals – a time eventually comes when what excited you when you were younger starts to seem mundane. Your main areas of expertise no longer place you on the cutting edge of science. That intense motivation you always counted on may start to wane.

And all this may happen at a time when, beyond your most basic professional commitments, you are free to do – or not to do – whatever you wish, and for the first time ever, “not” may start to seem like the better option.”

Other Measures of Academic Productivity: the Teaching Index

Teaching Index = # of Classes You've Taught

Range:

0 – 10
doesn't matter

10-100
nobody cares

>100
seriously
stop counting

Approach Teaching as a Research Project

Or

Bring the Research Approach Into Your
Teaching

Or

Teaching by Discovery Approach

- Attitude
- Opportunity
- Passion

Courses taught: level, enrollment

IMPLEMENTATION:

- Use resources available: don't reinvent
- Network with colleagues to share “techniques”
- Refine / improve the “research” idea
- Train students to do their own “research”
 - a) reading and teaching
 - b) grading
- Delegate and oversee
- Integrate goals
- Emphasize your own research interests

Refine / improve the “research” idea

Example 1: *Know your audience*



“teach the student you have, not
the ones you want to have”

Refining the idea: *Know your audience*



1. Their interests?
2. Reason for taking class?
3. Career goals?
4. Views of the course and science education?
5. View of their role in class
6. View of role of professor in class
7. Attitude towards their “inherent” aptitudes

AND

8. #1-7 about YOU !

Examples of:

- Delegate and oversee
- Train students to do their own “research”



Let students Communicate
and be Creative

Let students Teach and
Learn



CHALLENGE PROJECT

- Create and present a demonstration that illustrates a physiological process or concept
 - Rules:
 - Group project
 - Must take ≤ 2 minutes
 - Must present to faculty before class
 - Presentations to entire class
 - No powerpoint allowed
-

Group presentations

Group Topic

- 1 Neurotransmission
- 2 The hepatic portal system
- 3 Membrane transport mechanisms
- 4 Mechanism of drug absorption in stomach epithelium
- 5 Fight or flight response
- 6 Hydrogen ion transfer in the ETC., titled "At The End of the Line."
- 7 The heart as a pump
- 8 The physiology of *Ibogaine*
- 9 Differences in hematocrit between males and females
- 10 Nervous system: depression and anger
- 11 "Receptor Showdown": protein receptors, ligands & competitors
- 12 Signal amplification - (cell communication in tissues)
- 13 Phagocytosis
- 14 Sleep cycles and recuperative properties
- 15 Functions of respiratory system
- 16 The fate of oxygen after it's breathed in
- 17 Vitamin Metabolism



At The End of the Line (the ETC)

Heart As a Pump:
A Heart song



Examples of:

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Link science in classroom and its process to the students' (and your !) interests – making it relevant and meaningful



NEWS HEADLINES

March 27, 2009, 1:26 PM

**Meat vs. Climate: The
Debate Continues**

How Do We Get Baseball
Players to Stop Doping?

July 1, 2009, 10:11 AM

**Hollywood Family Takes
on Medical Mistakes**

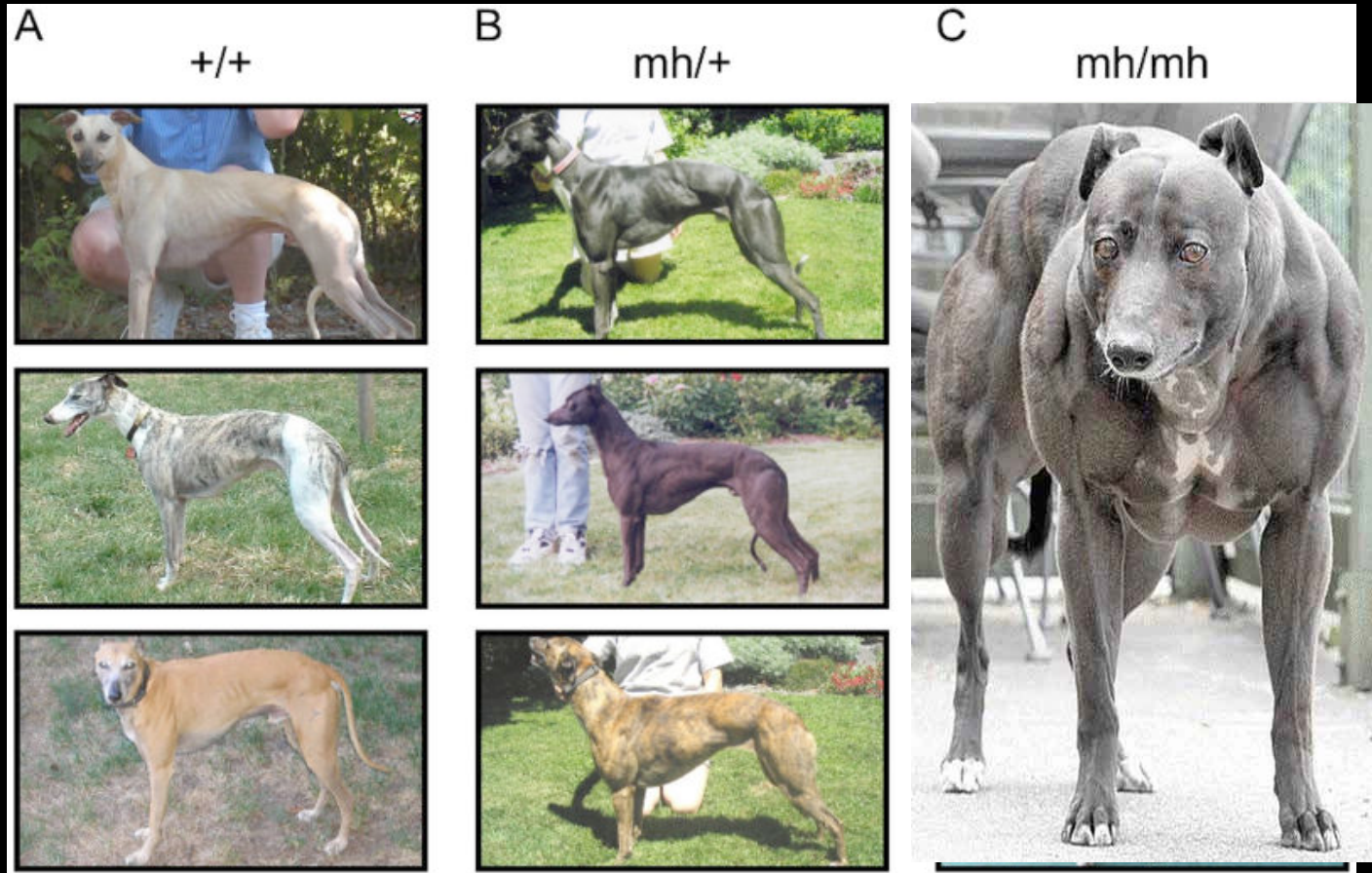
March 17, 2008, 9:26 AM

March 11, 2009, 10:44 AM

Is Banked Cord Blood Worth

It?

Myostatin mutations (ex: whippets)



How Do We Get Baseball Players to Stop Doping?

July 1, 2009, 10:11 AM

Which fluid replacement therapy do you give?



Lactated Ringer's



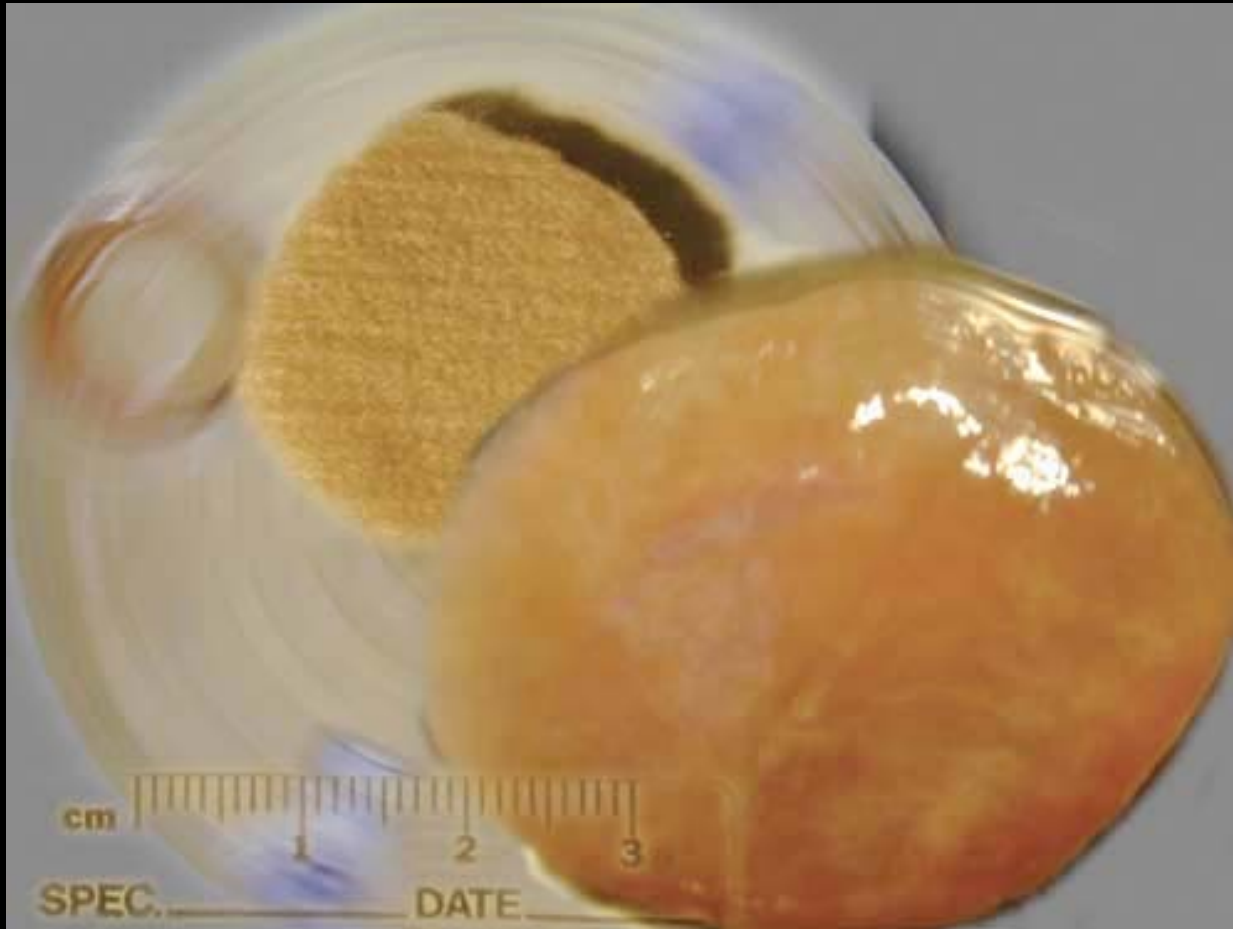
5% Dextrose



**Hollywood Family Takes
on Medical Mistakes**

March 17, 2008, 9:26 AM

Laboratory “bred” Meat



March 27, 2009, 1:26 PM

Meat vs. Climate: The Debate

Continues

How nutritious is blood?



March 11, 2009, 10:44 AM

Is Banked Cord Blood Worth It?

Given this diet, is it realistic for Cullen to do all that?

- Blood is > 95 percent water
- Some proteins
- Sprinkling of sugars
- Minerals (and other small molecules)
- Almost no fat

Hence:

1. Vampire bats don't have adipose stores
2. Vampire bats consume half their 1oz body weight in blood every night or risk starving to death.
3. Vampire bats urinate freely as they feed (the water in that blood meal would make the bats too heavy to fly)

** Majority of exclusive blood eaters are tiny arthropods —

** Other blood eaters supplement their diet with seeds and other more substantive goodies



Link science in classroom and its process to our role in the world



Christopher Reddy is director of the Coastal Ocean Institute, Woods Hole Oceanographic Institution, MA.

Scientist Citizens

PRESIDENT OBAMA'S INAUGURATION SPEECH DELIGHTED SCIENTISTS WHEN HE STATED, "WE WILL restore science to its rightful place." But he went on: "What is required of us now is a new era of responsibility. . . . This is the price and the promise of citizenship." For scientists, one often overlooked responsibility is explaining their work to people. This is not an unreasonable price for receiving public funds to do research. And it promises to combat ignorance, guide sound public thinking, and garner more support for science, while simultaneously inspiring and recruiting new young scientists. Now more than ever, issues such as climate change, obesity, stem cell research, green technology, and evolution are migrating from scientific journals to the non-science community, from school halls to the halls of Congress. It's critical that scientists venture beyond their laboratories to put these issues into the correct context and help the public understand what is known, unknown, and under debate.

But the walls of the ivory tower remain formidable. Just last month, for example, an editorial in *Analytical Chemistry* commented that federal funding agency requirements for outreach detract from young scientists' ability to conduct research and think deeply. Lack of time is an obstacle for young scientists, but scientists are no more overtaxed than many professionals are. A more entrenched obstacle is that the academic tenure process claims to evaluate research, teaching, and service, but in practice, service is rarely expected or rewarded. In fact, reviewers are well versed in recognizing good research but have little ability or data to evaluate outreach.

Universities must begin to give more than lip service to the service component in tenure evaluations. Land-grant universities, for example, specifically make cooperative extension work part of some faculty members' jobs. At the least, universities and professional organizations should devise detailed guidelines for evaluating the amount, quality, and effectiveness of outreach, so that peers can recognize it when they see it. Universities should also integrate communications into young scientists' basic training. Like lawyers in courts, physicians in hospitals, or baseball players on the field, scientists speak an insular language that is unknowable and intimidating to the uninitiated. As the former Editor-in-Chief of this magazine, David Kennedy, wrote: "Science and technology are increasingly relevant to public policy, and unless those who speak for science can be understood, the policy decisions are likely to be wrong."

At Stockholm University, all new Ph.D. students in environmental and climate sciences are now offered training in speaking with the media. Stanford University's School of Earth Sciences has launched an innovative program to train graduate students in similar skills. The Woods Hole Oceanographic Institution offered a graduate student course co-taught by scientists and journalists called "How Not to Write for Non-Reviewed Journals: Talking to Everybody Else." For more established scientists, professional programs exist: The Aldo Leopold Leadership Program, for example, has provided media training to a growing nucleus of more than 100 mid-career environmental scientists.

Such programs would provide incentive (or at least diminish the disincentive) for scientists to participate in outreach. Rather than viewing funding agency outreach requirements as annoying and vague, scientists can view them as opportunities to find ways to inspire young minds (and themselves), encourage underrepresented groups to enter science, establish collaborations between academia and industry, or otherwise enter the messy fray of democracy. The means by which the public and policymakers get scientific information have changed dramatically. The once linear transmission of research findings from the scientific community to the media, public, or policymakers has been transformed into a chaotic realm in which information (and disinformation) and opinions are vied through traditional and electronic sources (real-time blogs, chat rooms, and wikis) and not necessarily by the scientific community. Thomas Jefferson wrote, "An enlighten[ed] citizenry is indispensable for the proper functioning of a republic." If we believe that science has a rightful role in our society, then it is the scientific community's responsibility to enlighten the public, as to why and how. That doesn't mean scientists need to be celebrities, politicians, or lobbyists—just citizens.

— Christopher Reddy

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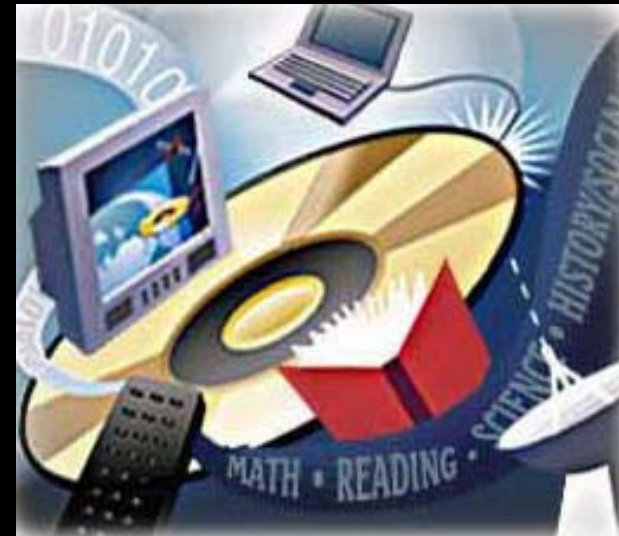
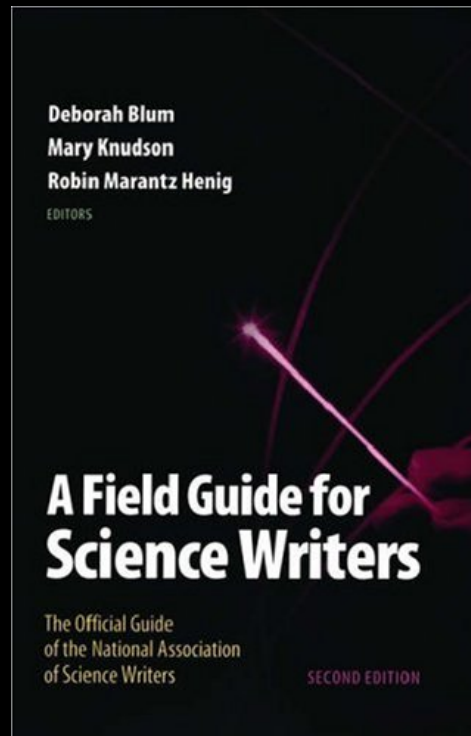
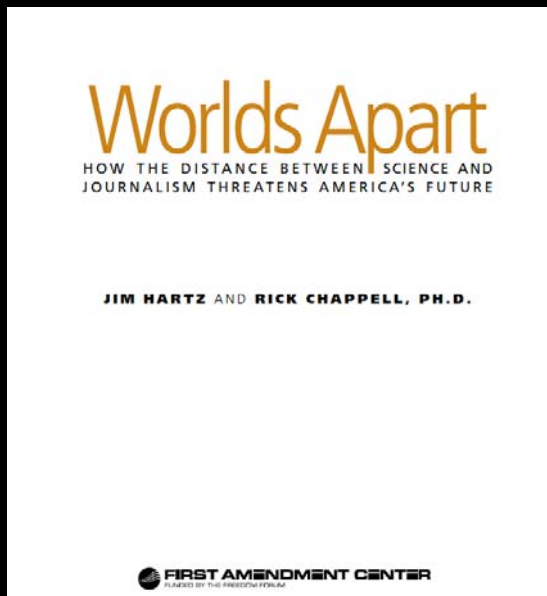
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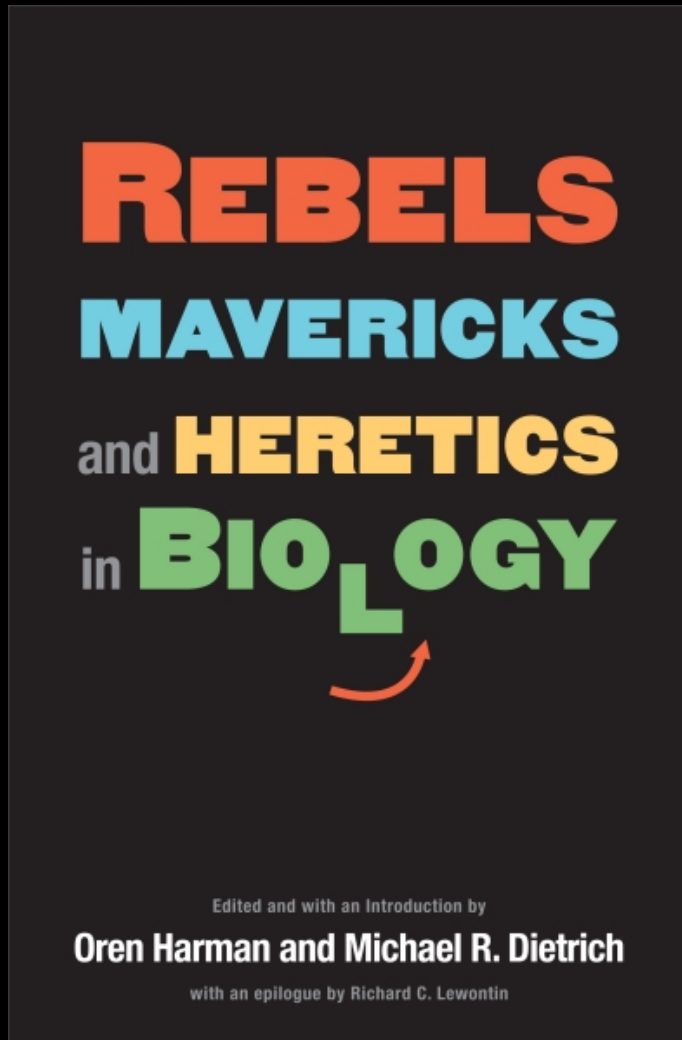
Examples of:

- Use resources available: don't reinvent
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Emphasize importance of Communication (verbal, written, and use of different media)



Use Variety of Sources



Howard Temin

Peter Mitchell

Roger Sperry

Barbara McClintock

Oswald Avery

Motoo Kimura

***Emphasize* importance of Communication**

(verbal, written, use of different media)

Ex: weekly assignment

One of the problems with the public understanding of science is that newspapers and the broadcast media do a very poor job of explaining basic research to the general public.

Hence, your duty as a scientist-in-training is to educate the general public about exciting findings in science.

Your first assignment as the science writer of the *Las Cruces Sun News* is to discuss the *Scientific Breakthrough of the Year* – the year you were born. In your essay, you must include a clear description of the scientific breakthrough that took place, the reason for being selected as the top scientific advancement that particular year, and the implications of the science findings to society in general.

The Brain Food

By Haroula Argiros

****The New York Times ****

May 6, 2009

This is really a no-brainer

Human health is one of the most common things we hear about on news today or read about in the little colorful brochures at our family doctor's office. The content of what we often hear or read about is always in the context of remedying an isolated "troubled" area of our body. The health of our heart, lungs, blood pressure, cholesterol levels, blood sugar or prostate health is just among the few things that is commonly discussed in hospitals yet treated as a separate entity in our bodies. Our health not only involves monitoring such "troubled" areas of our body, but also understanding how these areas are connected with one another. One of the most neglected of these body organs is, surprisingly, our brain. Despite the many health issues that do arise, when our brains are sick, society often associates this to psychosis or other severe brain abnormalities. What if the brain, like the heart, needed to be exercised? What if I told you that brain malfunction, like high blood sugar (or risk of diabetes) can simply be avoided through monitoring ones diet? A student from New Mexico State University, Regina Bradley, ventured to address these questions. She has dedicated an entire semester towards understanding how, through diet and exercise, the brain requires just as much attention than any other body organ our doctors emphasize taking care of. Ms. Bradley not only

intensely researched this subject matter via the mounds of books and endless online streaming, but she also went as far as visiting numerous offices of local doctors in the Las Cruces area. Her research and her results are quite surprising and within this issue we will discuss some of the possible approaches we all can take towards initiating a brain-healthy regiment.

Although most of society does not normally consider the health of the brain when considering the different facets of human health, there is a plethora of information available that demonstrates the flaws of this attitude. Ms. Bradley randomly called twenty local general physicians and asked them two questions:

- 1) How important is diet and exercise to overall body health?
- 2) What are common associated disorders?

After obtaining the comments from these physicians, she realized that not a single doctor mentioned, arguable the most important organ in our body, the brain! Responses to her questions were repeatedly in regards to the heart, bone, stomach, colon, lungs and energy levels while diseases mentioned were diabetes, heart attack, osteoporosis and cancer. Neuronal disorders, such as dementia or Alzheimer's, were never mentioned. In addition to this startling discovery, the USDA website also promotes the same

The New York Times

May 06, 2009

WHY WE SHOULD START PAYING MORE ATTENTION TO OUR BRAIN

As Regina Bradley fully explains in her article "How to Build a Better Brain", with the newest and more media-publicized diseases we tend to forget that we really need to take care of one of our most important organs: our brain, and the sooner we start, the better. So join me in going through Bradley's work and hopefully by the end of the article we will all immediately start to take action.

Silvia Paloma Sepúlveda Ramírez

How many times we have heard recommendations from our physicians, friends, family and the media on how to take care of our health to avoid diseases like cancer, diabetes or infectious diseases? And it is not difficult to observe that with cancer and diabetes levels raising daily in the population and new strains of infectious diseases arising apparently from nowhere, like the new Influenza AH1N1 virus, we tend to forget about the organ that orchestrates it all: our brain.

But as Bradley points it, we need to be informed of the importance of taking good care of our brain, and exactly how we can do it with our day to day actions and incorporate these elements into our routine. As you will read on, it is not difficult at all, and the rewards are extremely worthy. And by this I do not mean forgetting the organs and diseases that have won our attention in the last decades, as the actions we can take to improve our brain health will also improve our overall health.

So in summary: "How to build a better brain?", well taken from Bradley's analysis, there are two fundamental actions we need to start to take care of right this minute: diet and exercise. We need to provide our brain with the quality food and nutriments it needs to better perform its functions. And exercise, we need to start using our brain, stop using the calculator for a simple $2 + 2$ and find joy in challenging our brain with memory games, puzzles, and all kind of information in our academic or professional lives that will put our brain to work hard.

Now, there is a third factor that we cannot forget and that may be more difficult to control than the two mentioned above: stress. Stress from our everyday life and toxins coming from household products or prescription drugs alter our brain's memory system. A disadvantage of brain damage through all of these factors, is that we do not become aware of them until we are dealing with the consequences. You will not experience an increase in sugar blood levels as in diabetes, or fever as in infectious diseases, but the damage is there and it is not that easy to find. Though there are actions we can take to have a good idea of the levels of damage of our brain. For instance, Bradley has developed "tests" a set of questions directed to find out the person's habits, abilities or disabilities to elucidate the state of the brain.

Training students in science : Link their science education to their training as scientists

Biology 350/550: Special Topics (2 cr)

Being a *Scientist* - Critical & Creative Thinking

Spring 2009

T-Th 10:20-11:30

Science is creative. But, scientists follow certain rules to transform initial ideas into reliable conclusions.

This course introduces the Scientific Method as one of many tools in the “scientist’s toolbox” to solve problems and to apply as a prediction/explanation of biological phenomena.

An open discussion format based on:

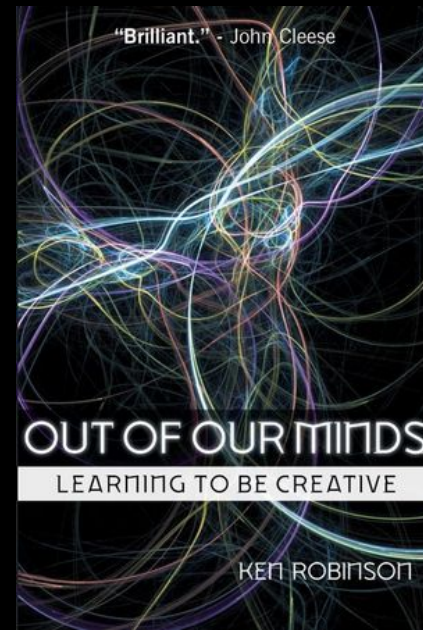
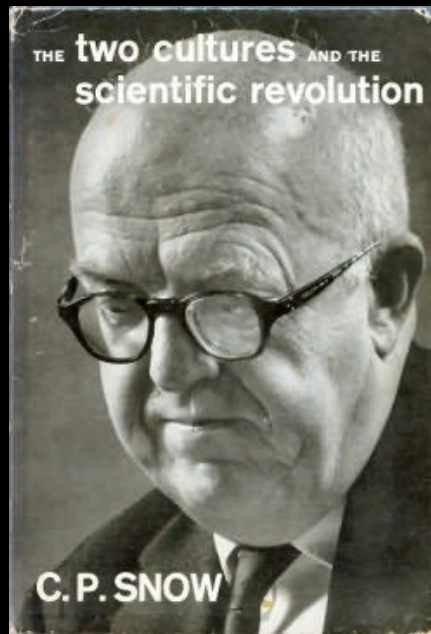
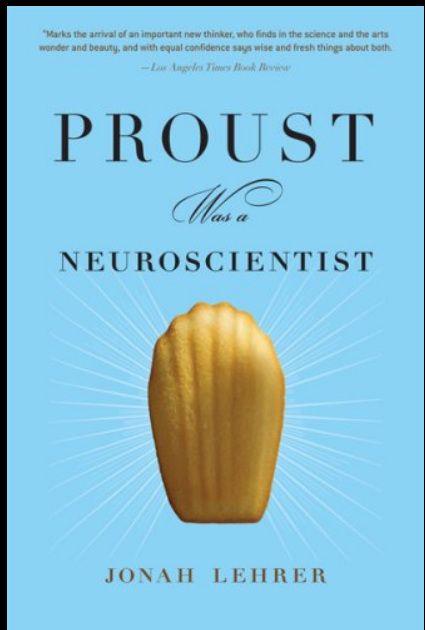
- * Readings from Journal articles and book chapters from *The structure of scientific revolutions* (Thomas Khun), *The scientific approach* (Carlo Lastrucci), *Science as Falsification* (Karl Popper), and *Against method* (Paul Feyerabend).
- * Students’ own creative and critical experimental writings on their preferred scientific endeavor
- * Case-scenarios chosen to promote problem-solving skills

“The whole of science is nothing more than a refinement of everyday thinking.”

-Albert Einstein



The Art and Science of Problem Solving



- * Creativity and innovation play central role in both ways of working and thinking
- * Both value observation of environment through senses

What is *SCIENCE*?

Group Activity

(Show poster)

Experiment in the classroom

Try new ideas and let students know about it



- News of the day
- Groups to the board
- Student-led discussion of case study problem
- What's wrong with this scene?
- **Be a reporter**
- **Edit your peers' work**
- **Have "lab meetings" in classroom**

Ex: Know your audience – What's in it for me?

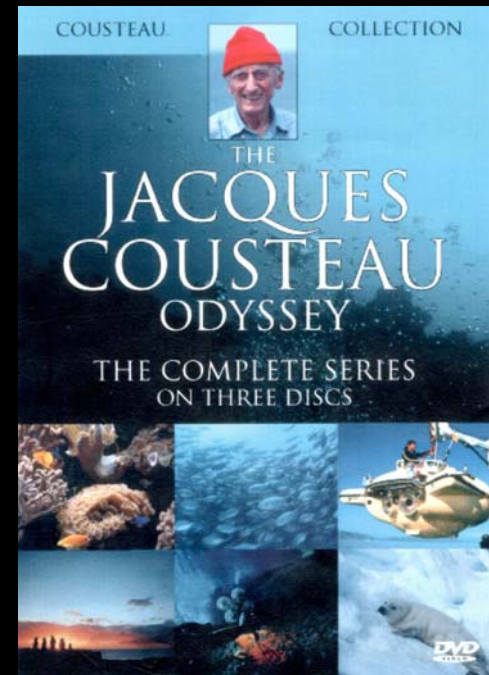
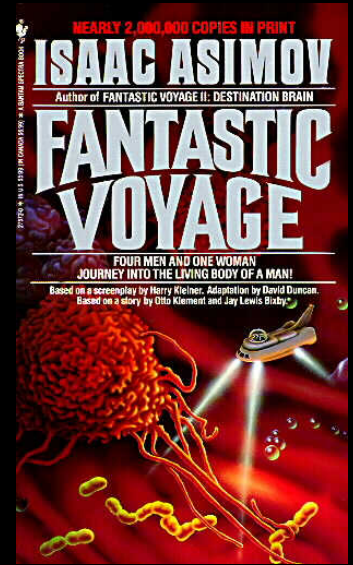
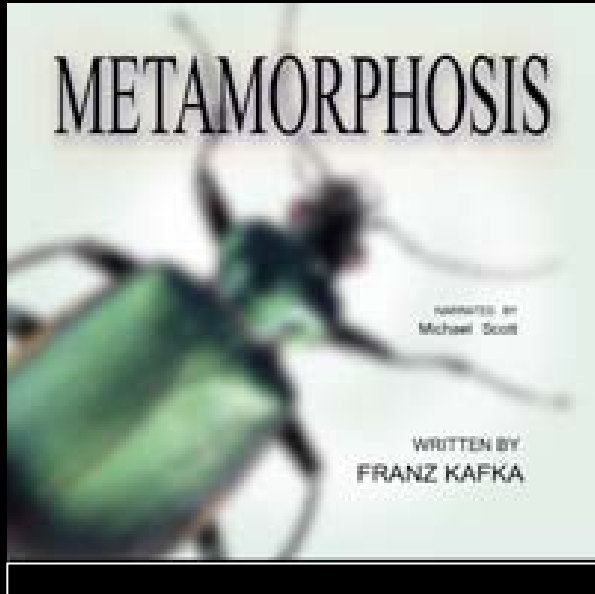
The most beautiful thing we can experience is the mysterious. It is the source of all true art and science

Albert Einstein

**Imagination will often carry us to worlds that never were.
But without it we go nowhere.**

Carl Sagan

What I want to do when I grow up



The classroom as “the science lab”

- Use resources available: don't reinvent
- Network with colleagues to share “techniques”
- Refine / improve the “research” idea
- Train students to do their own “research”
 - a) reading and teaching
 - b) grading
- Delegate and oversee
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Plasticity





Connect Art and Creativity with Science

– Sir Ken Robinson

