

# Sleeping with the enemy



## A Mindful Guide to Sustainable Well-being

Donal MacCoon, Ph.D.



*The Waisman Laboratory  
for Brain Imaging and Behavior*



# A Whole Life



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# A Whole Life



An Integrated Approach  
to Sustainable Well-being

Donal MacCoon, Ph.D.

sustainable**wellbeing**.org



Why integration &  
sustainable well-being  
are critical  
...a few problems



2007 Nobel Prize  
IPCC & Al Gore

- Water scarcity
  - 75-250 million by 2020 in Africa
  - Up to 50% decline in agriculture
- Ecosystem: 20-30% extinctions
- Food shortages
- Coasts: .4 - 1.4 m rise in sea level is best case stabilization scenario
- Health: malnutrition, disease, heat/floods/droughts
  - WHO estimate: 150k annual deaths  
(McMichael, 2001; McMichael et al., 2004)





- Widespread use of human-made chemicals begins in 1950's (Vomsaal, 1996)

## What we don't know about chemicals

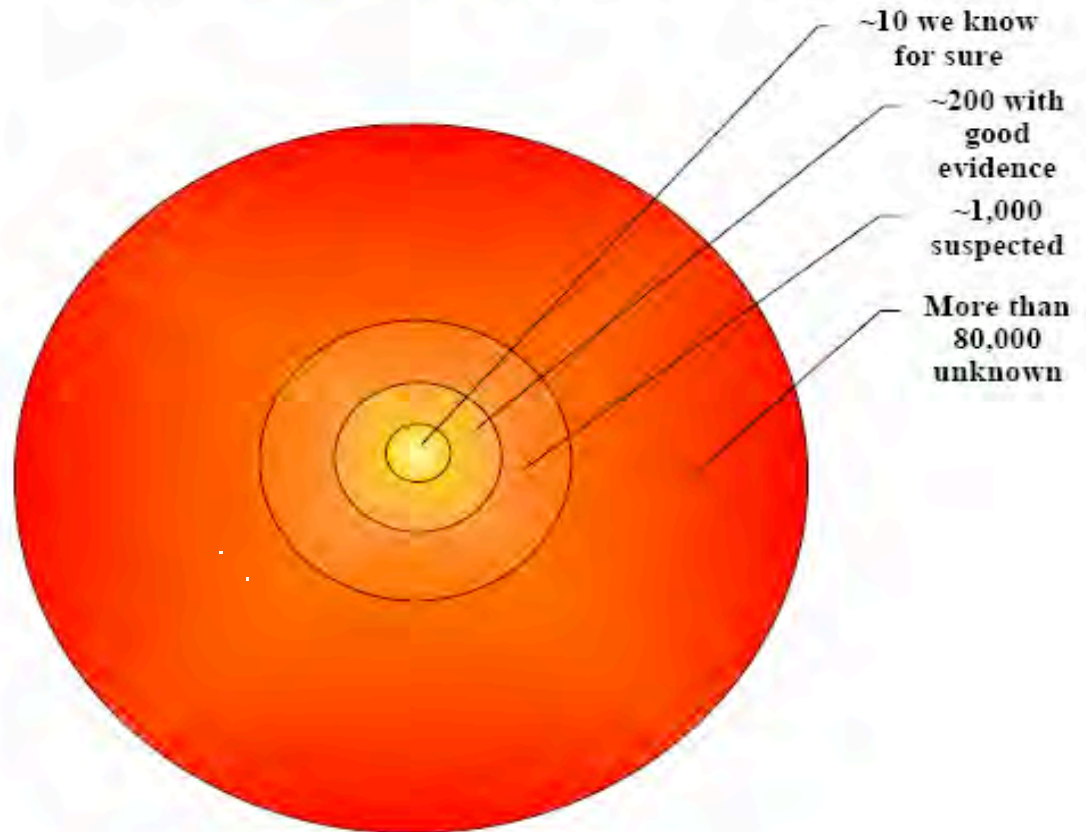


Figure 2.



The Collaborative on Health & the Environment (CHE)  
Consensus Statement 2007



## **BodyBurden** **The Pollution in Newborns**

A benchmark investigation of industrial chemicals, pollutants, and pesticides in human umbilical cord blood

# **Body Burden: The Pollution in Newborns**

**A benchmark investigation of industrial chemicals, pollutants and pesticides in umbilical cord blood**

*Environmental Working Group, July 14, 2005*

*10 newborns, \$10,000/baby for study*

## **287 chemicals detected:**

- **180 cause cancer in humans or animals**
- **217 are toxic to the brain and nervous system**
- **208 cause birth defects or abnormal development in animal tests**

<http://www.ewg.org/reports/bodyburden2>

See also: Centers for Disease Control and Prevention. (2005) Third National Report on Human Exposure to Environmental Chemicals. Atlanta (GA): CDC Available at: <http://www.cdc.gov/exposurereport/report.htm>

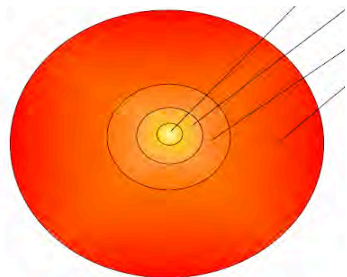




# Interactions & low doses

- aldicarb (insecticide), atrazine (herbicide), & nitrate (fertilizer)
  - Aggression
  - Thyroid
  - Immune

Porter, Jaeger, & Carlson (1999)



# How many 2 & 3-way interactions from 80k chemicals?

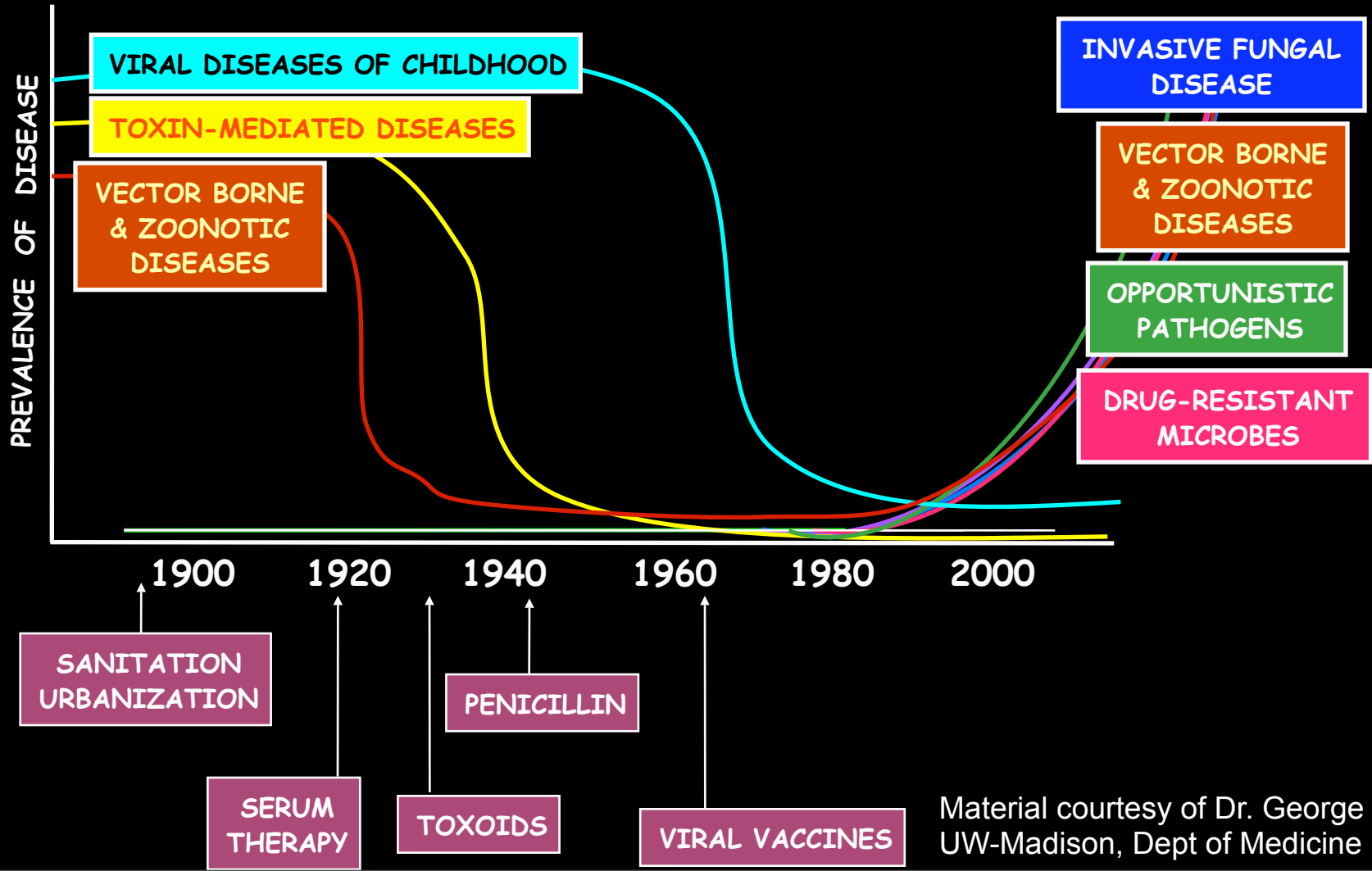
- Over 85 trillion (85,303,200,000,000)
- 50,683 lifetimes just to count them  
(at 2 per sec)

# Last lifetime being infection free?

“One can think of the middle of the 20<sup>th</sup> century as the end of the most important social revolution in history – the virtual elimination of infectious disease as a significant factor in social life.”

Sir M. Burnet, 1962  
Nobel Laureate

# Emerging Infectious Diseases



# Current antibiotic resistant bacteria

- Acinetobacter
- S. pneumoniae
- VRE
- MRSA, VISA, & VRSA
- MDR-TB, XDR-TB
  - Airborne
  - South Africa: 52 of 53 died (WHO, 2006)

INVASIVE FUNGAL  
DISEASE

VECTOR BORNE  
& ZOONOTIC  
DISEASES

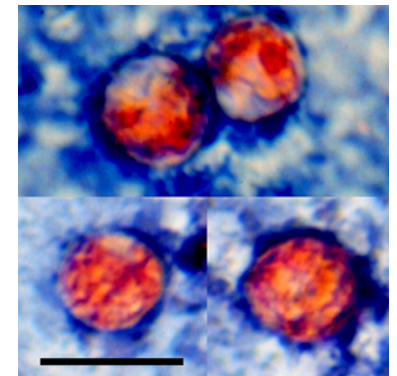
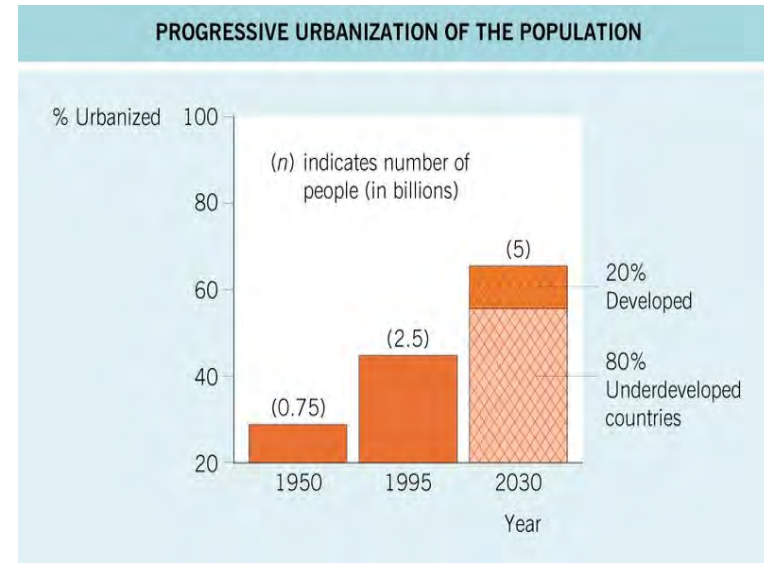
OPPORTUNISTIC  
PATHOGENS

DRUG-RESISTANT  
MICROBES



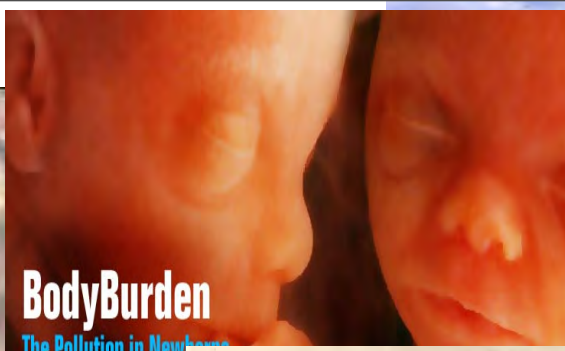
# Major Factors Contributing to the Emergence of Infectious Diseases

- Human demographics and behavior
  - urbanization
- Industry and commerce
  - Over use of antibiotics in animals creates drug-resistant bacteria
  - Huge farms: animals close proximity
  - Non-local food: cyclospora parasite



Material courtesy of Dr. George Mejicano,  
UW-Madison, Dept of Medicine

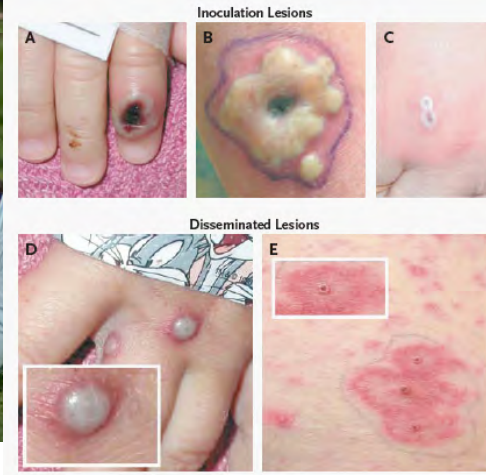
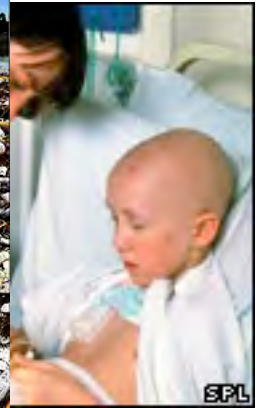




# BodyBurden

## The Pollution in Newborns

A benchmark investigation of the chemicals, pollutants, and pesticides in newborns' blood.





# The unraveling

## The Turning





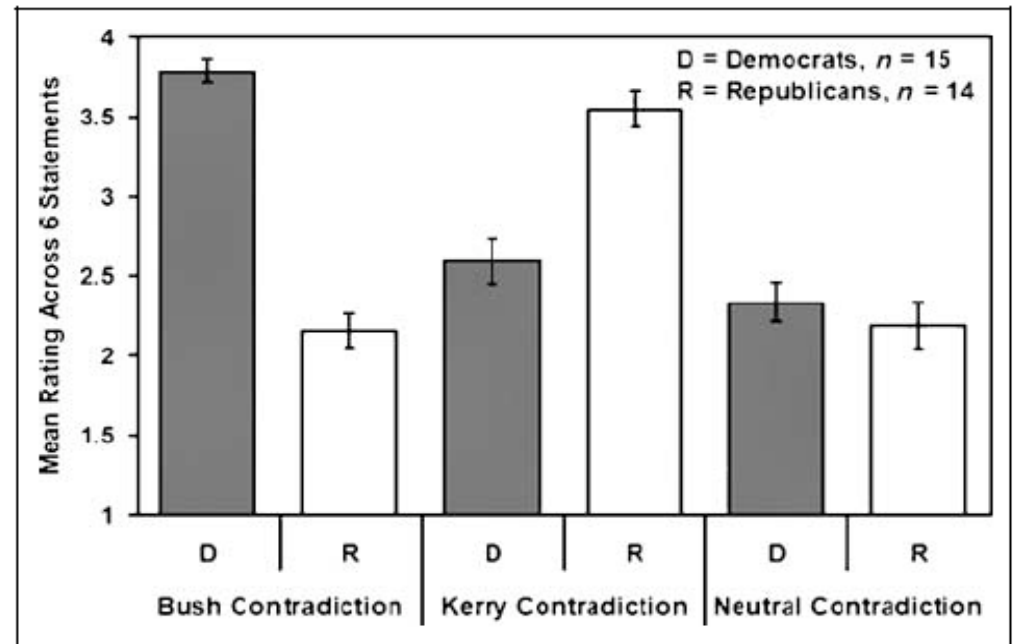
# Reactivity as Barrier

- Repression
  - Report low anxiety but exhibit anxious physiology (Weinberger, et al., 1973, JAP)
- Defensive Deniers
  - higher (and medically significant) cardiovascular reactivity associated with higher distress relative to genuinely healthy individuals (Shedler, Mayman, et al., 1993)



# Bounded rationality vs. Motivated reasoning

- Democrats & Republicans read statements about Bush, Kerry, or Tom Hanks (for ex)
- Consistently identified contradictions in “other” candidate but not own



- Negative emotion registered when contradiction was introduced
- With time to reach biased conclusion, neg affect replaced by pos
- “brain converges on solutions that minimize negative and maximize positive affect states” (Westin, et al., 2006, Jo of Cog Neuro, p. 1947)
- Neg emotion --> biased cognition --> positive emotion

# Positivity Bias?



- Bias: wanting to see & grasp the positive, avoid & push away the negative
- This bias is endemic in casual approaches to happiness/well-being





Whining --> neg emotion --> “stop whining” --> Feel better



# SLEEPING WITH THE ENEMY: A MINDFUL GUIDE TO SUSTAINABLE WELL BEING

*Presented by Dr. Donal MacCoon*



Wednesday,  
April 21, 2010

6:00pm



esday,  
1, 2010

0pm

ey College  
ter Atrium  
lford Road

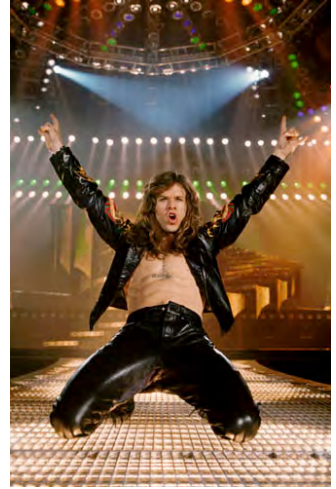
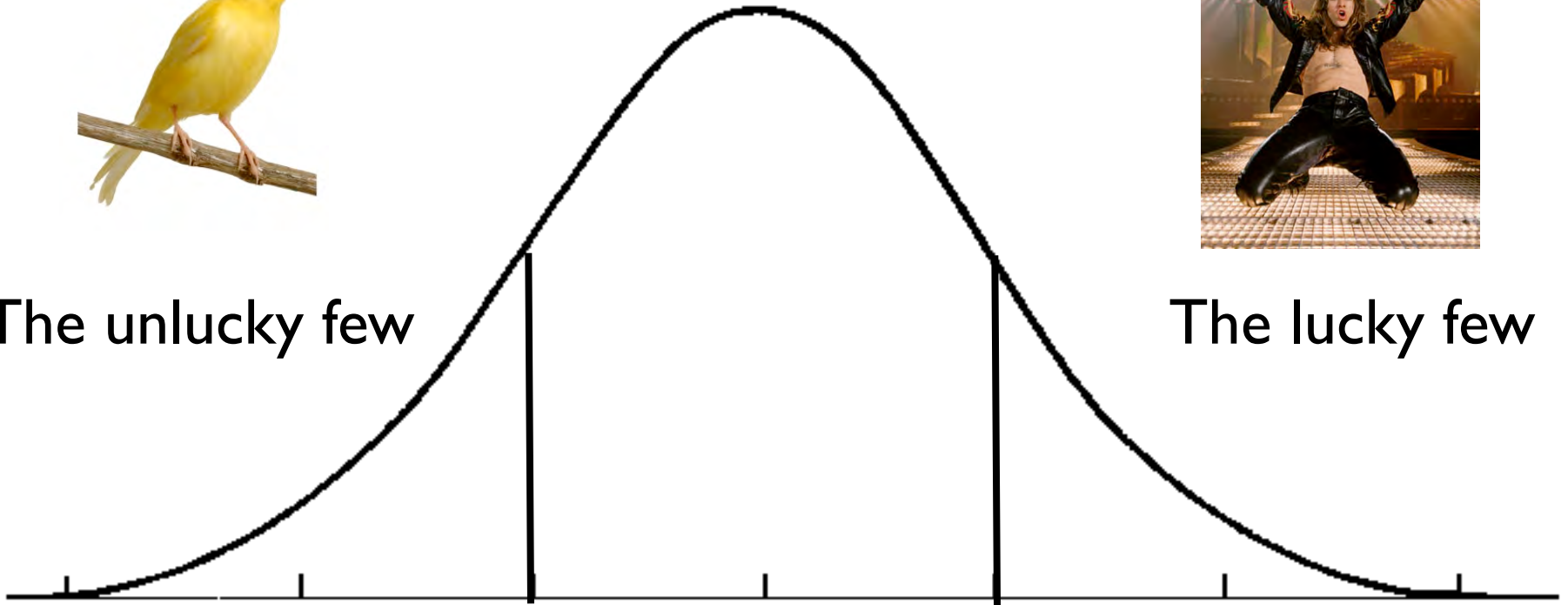
reshments  
available  
starting at 5:30pm!

Davidson, a neuroscientist at the  
Waisman Laboratory for Brain  
Imaging and Behavior. Dr. MacCoon  
is conducting research on  
Mindfulness and Sustainable Well-  
being ([www.sustainablewellbeing.org](http://www.sustainablewellbeing.org)).  
He is also the Research Coordinator  
for the UW-Health Integrative  
Medicine's Mindfulness Center and a

**Admission is free**



The unlucky few



The lucky few

# Singing for the Canary

- 55% increase in acute lymphocytic leukemia in children from 1975 to 2006
- ALL - 90% cure rate
- Some scenarios on getting to that cure
  - 3.5 years
  - bankruptcy
  - lost jobs
  - long term learning disabilities & other problems





- Performance of “I cannot breathe”



# The Turning



# Integration

- Combine (one thing) with another to form a whole
- from Latin *integrat*- 'made whole'
- Compare with *integrity*: the state of being whole and undivided

“One does not become  
enlightened  
by imagining figures of light  
but by making the darkness  
conscious.

This procedure, however,  
is disagreeable and  
therefore not very popular.”

– Carl Jung “The Philosophical Tree” (1945).  
In CW 13: Alchemical Studies, p. 335



**cai guo-qiang on the roof, transparent monument**  
the metropolitan museum of art, new york, usa, 2006

What are we integrating?

# A Whole Life



To what end?



An Integrated Approach  
to Sustainable Well-being

# What are we integrating?

Some are  
the enemy

Mind (Ts, Es) & Body  
Self, Community, Planet  
7 generations



## To what end?

Resolving BIG problems through  
Sustainable Well-being (SWB)

## How?

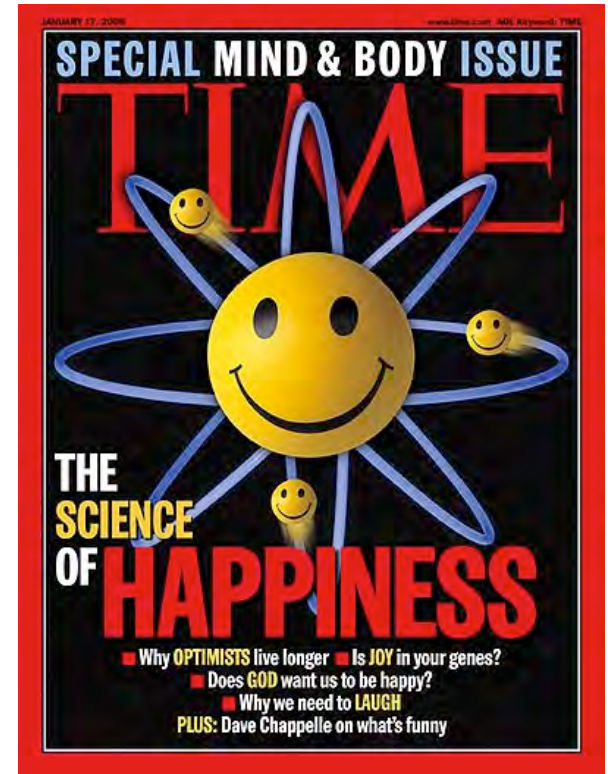
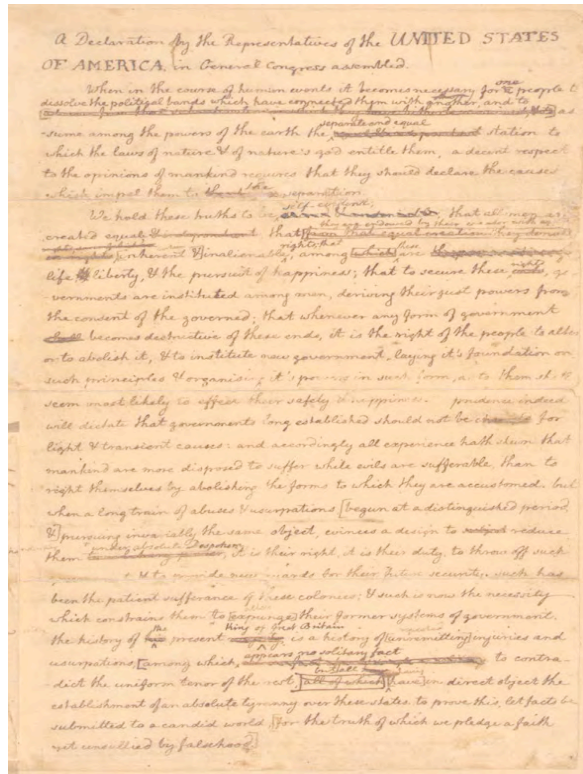
Lifestyle change

Decreased emotional reactivity

Together







“Salud, amor, y pesetas, y tiempo para gozarlos”

# It goes 7.4 miles!



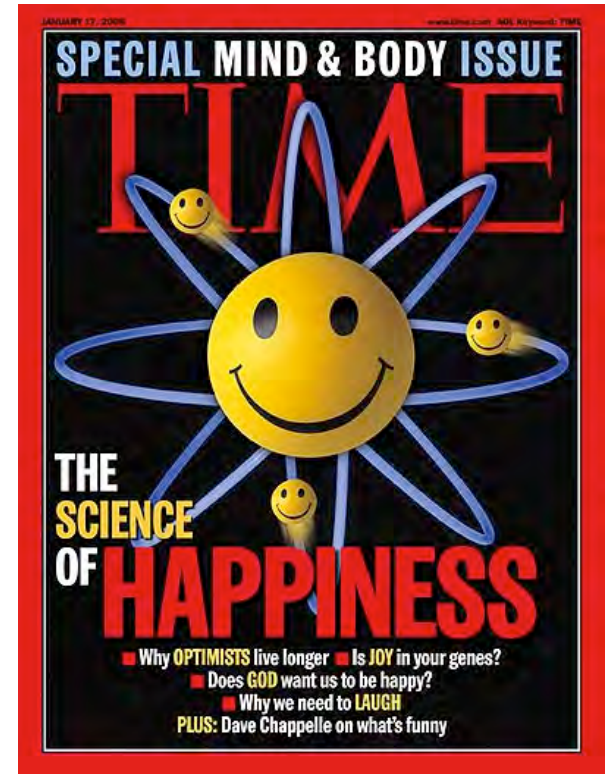
Denominator

- per hour?
- til it dies?
- per gallon?

A Declaration by the Representatives of the UNITED STATES OF AMERICA, in General Congress assembled.

When in the course of human events it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the laws of nature and of nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to separate.

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty, and the pursuit of Happiness. That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed; that whenever any Form of Government becomes destructive of these ends, it is the right of the people to alter or to abolish it, & to institute new Government, laying its foundation on such principles & organizing it in such form, as to them it shall seem most likely to effect their safety & happiness. Prudence, indeed, will dictate that Governments long established should not be changed for light & transient causes; and accordingly all experience hath shewn that mankind are more disposed to suffer while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses & usurpations (beginning at a distinguished period) pursuing invariably the same object, evinces a design to reduce them to absolute Tyranny, it is their duty to throw off such Government, & to provide new Guards for their future security. Such has been the patient sufferance of these Colonies; & such is now the necessity which constrains them to alter their former Systems of Government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct or indirect object the establishment of an absolute Tyranny over these States. To prove this, let facts be submitted to a candid world, for the truth of which we pledge a faith not swayed by falsehood.



# Denominator?

# Sustainable Well-Being

Well-being

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Resources to get WB

# Sustainable Well-Being

(Mental & Physical Health) \* Longevity

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Ecological Footprint

# Sustainable Well-Being

(Mental & Physical Health) \* Longevity

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Ecological Footprint



# Sustainable Well-Being

(Mental & Physical Health) \* Longevity

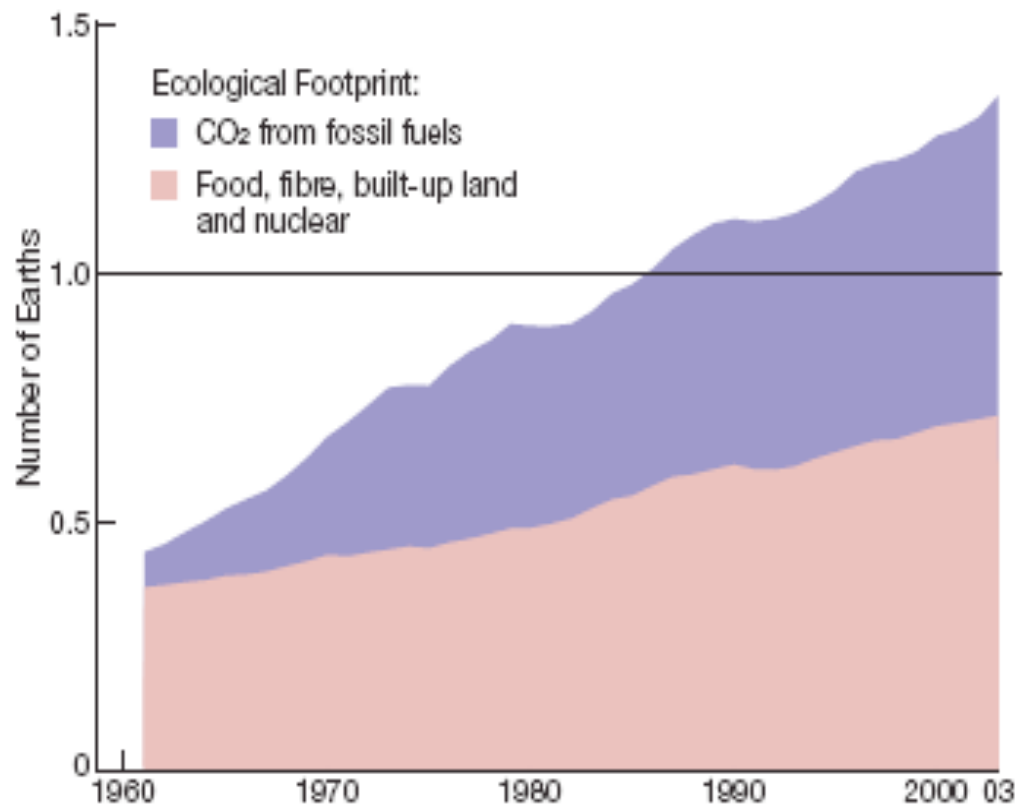
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Ecological Footprint



# How much of the Earth's resources does your lifestyle require?

Fig. 1: **HUMAN DEMAND ON THE BIOSPHERE, 1961–2003**



Life Sat	Life Exp	EF	HPI	Rank
7.4	77.4	9.5	28.8	150

How are we doing?

	Life Sat	Life Exp	EF	HPI	Rank
Vanuata	7.4	68.6	1.1	68.2	1
Costa Rica	7.5	78.2	2.1	66	3
Cuba	6.3	77.3	1.4	61.9	6
Switzerland	8.2	80.5	5.3	48.3	65
UK	7.1	78.4	5.4	40.3	108
Sweden	7.7	80.2	7	38.2	119
France	6.6	79.5	5.8	36.4	129
Lithuania	4.7	72.3	3.9	29.3	149
<b>USA</b>	7.4	77.4	9.5	28.8	150
UAE	7.4	78	9.9	28.2	154
Ukraine	3.6	66.1	3.3	22.2	174
Zimbabwe	3.3	36.9	1	16.6	178

# Sustainable Well-Being

(Mental & Physical Health) \* Longevity

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Ecological Footprint



Life Sat	Life Exp	EF	HPI	Rank
7.4	77.4	9.5	28.8	150

## Well-being: Physical Health

24th in world for disability adjusted life expectancy

"Basically, you die earlier and spend more time disabled if you're an American rather than a member of most other advanced countries"

Life Sat	Life Exp	EF	HPI	Rank
7.4	77.4	9.5	28.8	150

## Q: Why?

- Some groups (e.g., Native Americans, inner city poor) have extremely poor health, more characteristic of a poor developing country rather than a rich industrialized one
- HIV kills or disables more in U.S. than in most other advanced countries
- U.S. a leader for cancers relating to tobacco
- A high coronary heart disease rate
- High levels of violence, especially of homicides, when compared to other industrial countries (Crime is up 300% from 1950-1980 & still above 1950 levels; Layard, 2005)

## A: Social Justice & Lifestyle





# Well-being: Mental Health

Life Sat	Life Exp	EF	HPI	Rank
7.4	77.4	9.5	28.8	150

**Table 2. Twelve-Month Prevalence of World Mental Health Composite International Diagnostic Interview/Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition\***

Country	% (95% Confidence Interval)				
	Anxiety	Mood	Impulse-Control	Substance	Any
<b>Americas</b>					
Colombia	10.0 (8.4-11.7)	6.8 (6.0-7.7)	3.9 (3.2-4.7)	2.8 (2.0-3.7)	17.8 (16.1-19.5)
Mexico	6.8 (5.6-7.9)†	4.8 (4.0-5.8)	1.3 (0.9-1.8)‡	2.5 (1.8-3.3)	12.2 (10.5-13.8)‡
United States	18.2 (16.9-19.5)	9.6 (8.8-10.4)	6.8 (5.9-7.8)	3.8 (3.2-4.5)	28.4 (24.7-28.0)
<b>Europe</b>					
Belgium	6.9 (4.5-9.4)	6.2 (4.8-7.8)§	1.0 (0.3-1.8)‡	1.2 (0.6-1.9)‡‡	12.0 (9.6-14.3)
France	12.0 (9.8-14.2)	8.5 (6.4-10.6)§	1.4 (0.7-2.0)‡	0.7 (0.3-1.2)‡‡	18.4 (15.3-21.5)
Germany	6.2 (4.7-7.6)	3.6 (2.8-4.3)§	0.3 (0.1-0.8)‡	1.1 (0.4-1.7)‡‡	9.1 (7.3-10.8)
Italy	5.8 (4.5-7.1)	3.8 (3.1-4.5)§	0.3 (0.1-0.5)‡	0.1 (0.0-0.2)‡‡	8.2 (6.7-9.7)
Netherlands	8.8 (6.6-11.0)	6.9 (4.1-9.7)§	1.3 (0.4-2.2)‡	3.0 (0.7-5.2)‡‡	14.9 (12.2-17.6)
Spain	5.9 (4.5-7.3)	4.9 (4.0-5.8)§	0.5 (0.2-0.8)‡	0.3 (0.0-0.5)‡‡	9.2 (7.8-10.6)
Ukraine	7.1 (5.6-8.6)†‡	9.1 (7.3-10.9)§	3.2 (2.4-4.0)†‡‡	6.4 (4.8-8.1)‡‡	20.5 (17.7-23.2)
<b>Middle East and Africa</b>					
Lebanon	11.2 (8.9-13.5)	6.6 (4.9-8.2)	1.7 (0.8-2.8)†‡‡	1.3 (0.0-2.8)	16.9 (13.6-20.2)
Nigeria	3.3 (2.4-4.2)	0.8 (0.5-1.0)	0.0 (0.0-0.1)†‡‡	0.8 (0.3-1.2)	4.7 (3.6-5.8)
<b>Asia</b>					
Japan	5.3 (3.5-7.0)†	3.1 (2.2-4.1)	1.0 (0.4-1.5)†‡‡‡	1.7 (0.3-3.0)	8.8 (6.4-11.2)
<b>People's Republic of China</b>					
Beijing	3.2 (1.8-4.6)†				
Shanghai	2.4 (0.9-3.9)†				

Source: WHO World Mental Health Survey Consortium (2004), JAMA

# Sustainable Well-Being

Well-being

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Resources to get WB



# Resources Used

Life Sat	Life Exp	EF	HPI	Rank
7.4	77.4	9.5	28.8	150

- U.S. uses 6.8 planets worth of resources
- We use more energy/person than any other country (except UAE)
- U.S. & allies outspend all non-allies militarily
- “Providing adequate food, clean water, and basic education for the world’s poorest could all be achieved for less than people spend annually on...

makeup, ice cream, and pet food” (p.10, State of the World, 2004)



# Sustainable Well-Being

(Mental & Physical Health) \* Longevity

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Ecological Footprint



Work more, achieve less, &  
destroy the planet in the bargain

# What are we integrating?

Mind (Ts, Es) & Body  
Self, Community, Planet  
7 generations



## To what end?

Sustainable Well-being =  $\frac{\text{Well-being}}{\text{EF}}$

## How?

Lifestyle change  
Decreased emotional reactivity  
Together

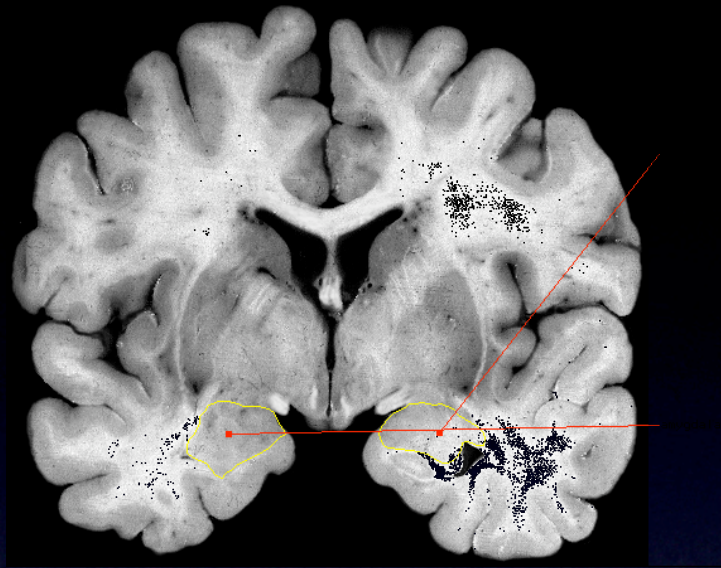




# Reconsider the primacy of will:

we underestimate the impact of things that are not our current focus of attention

- Our genes
- Our previous experience (e.g., automatic habits)
- Our context (e.g., physical environment, other people)
- Our emotions (e.g., repressed)
- Our thoughts (e.g., ruled by emotion)
- Why? To avoid feeling helpless, to feel in control



# Amygdala

- Amygdala fires to
  - jump from the snake or bus
  - avoid danger
- Attention is needed even for awareness of amygdala-mediated stimuli (Pessoa, Padmala, & Morland, 2005, NeuroImage)

# Stroop Task

RED BLUE GREEN YELLOW BLUE  
YELLOW GREEN RED BLUE GREEN YELLOW  
RED GREEN BLUE RED YELLOW YELLOW  
GREEN RED BLUE RED GREEN BLUE  
YELLOW YELLOW BLUE RED YELLOW GREEN  
BLUE RED GREEN BLUE YELLOW RED



# Stroop Task

XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
XXXXX	XXXXX	XXXXX	XXXXX	XXXXX
XXXXX	XXXXX	XXXXX	XXXXX	XXXXX

Read the font color – as quickly and accurately as possible

# Stroop Task

RED BLUE GREEN YELLOW BLUE  
YELLOW GREEN RED BLUE GREEN YELLOW  
RED GREEN BLUE RED YELLOW YELLOW  
GREEN RED BLUE RED GREEN BLUE  
YELLOW YELLOW BLUE RED YELLOW GREEN  
BLUE RED GREEN BLUE YELLOW RED

Read the font color – as quickly and accurately as possible

# Limited capacity of attention

- Who decided to attend to the font color?
- Note the limited capacity
- Attention/awareness is a form of listening
  - Sets of neurons elsewhere in our brain are represented in the PFC
  - Gated in
  - In this way, we can consider all the data (even the enemy)
  - Allows integration within our own skulls





# Integrating parts of ourselves

- Authenticity associated with less depression & anxiety, lower stress, greater subjective vitality, & lower physical Sxs (Ryan, LaGuardia, & Rawsthorne, 2005)
- More distinct one is across different roles, less well-being (Sheldon, Ryan, et al. JPSP, 1997)



# Mindfulness

- Paying attention, on purpose, non-judgmentally
- Being aware of sensations, thoughts, emotions occurring right now without judgment





# Mindfulness



- being aware is the act of integrating, remembering all parts of ourselves
- welcoming them into awareness without judgment
- practicing is making awareness more automatic?

# Mindfulness effective for...

- **Anxiety, depression, stress, burnout** (e.g., Cohen-Katz, Wiley, et al., 2005; Ma & Teasdale, 2004; Teasdale, Segal, Williams, et al., 2000)
- **Chronic pain** (Kabat-Zinn, 1982; Kabat-Zinn, Lipworth, & Burney, 1985)
- **Substance abuse** (Bowen, Witkiewitz, Dillworth, et al., 2006)
- **Arthritis** (Pradhan et al., 2007)
- **Diabetes** (Gregg, Callaghan, et al., 2007)
- **Fibromyalgia** (Sephton et al., 2007; Grossman, et al., 2007)
- **Psoriasis** (Kabat-Zinn et al., 1998)



# Mindfulness effective for...

- Positive resting frontal alpha-asymmetry (Davidson, et al., 2003; Barnhofer et al., 2007)
- **Immune Function** (Davidson, Kabat-Zinn et al, 2003)



## ...and different types of people

- **Cancer patients** (Specia, Carlson, et al., 2000; Monti, Peterson, et al., 2005; Carlson, Specia, et al., 2007)
- **Health care professionals** (Shapiro, et al, 2005)
  - **Medical Students** (Shapiro, et al., 1998)
  - **Nurses** (Cohen-Katz, Wiley, et al ., 2005)
- **Women with heart disease** (Tacon, McComb, Caldera, Randolph, 2003)
- **Prisoners** (Bowen, Witkiewitz, Dillworth, et al., 2006)
- **Borderline Personality Disorder** (DBT, Linehan, 1993)





# Mechanisms of Change?

- Attention is needed even for awareness of amygdala-mediated stimuli (Pessoa, Padmala, & Morland, 2005, NeuroImage)
- Increased control of habitual responding (Wenk-Sormaz, 2005)
- Better reality sampling (Slagter, Lutz, Greischar, et al. (2007; PLOS Biology)
- Meta-cognitive awareness (Teasdale, et al. 2002)
  - CT & MBSR --> increased meta-cog awareness --> decreased depression
  - MBCT reduces overgeneral memory bias (Williams, Teasdale, Segal, & Soulsby, 2000)



# Cluttered Room: Attentional Blink

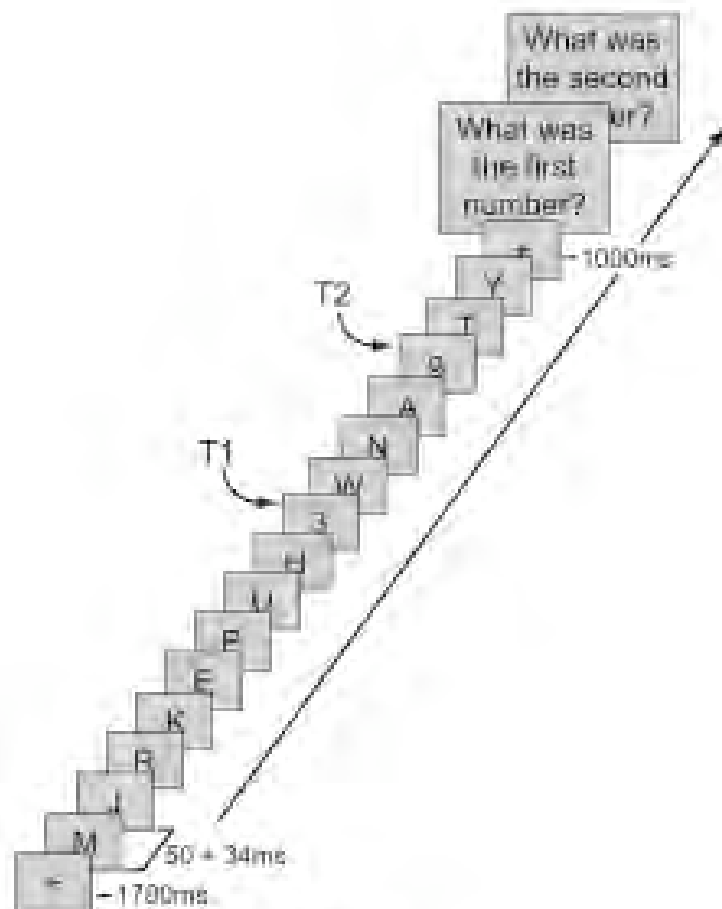


Figure 1. Attentional-Blink Task

- Attention capacity is limited
- Evidenced when 2nd of 2 close targets not seen (close means  $< 500$  ms)

- 17 experienced practitioners (Ps) vs. 23 novices (Ns)
- Pre-post 3 months (retreat for Ps)
- No diffs at time 1
- Training changes distribution of limited capacity attention
  - reduced blink (increased T2 accuracy)
  - reduced P3b amplitude at 400 ms
  - Greater reductions in P3b associated with better accuracy

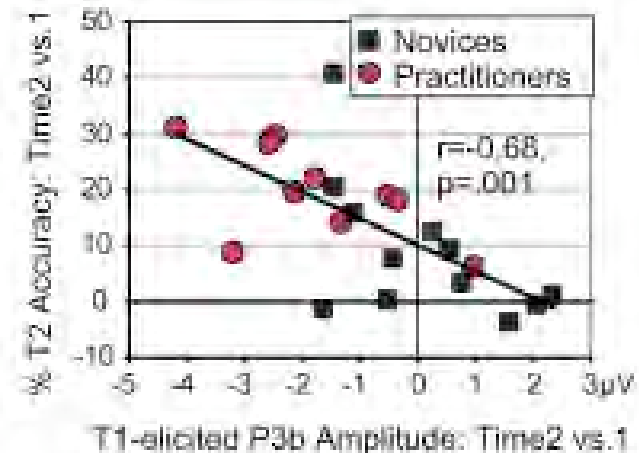
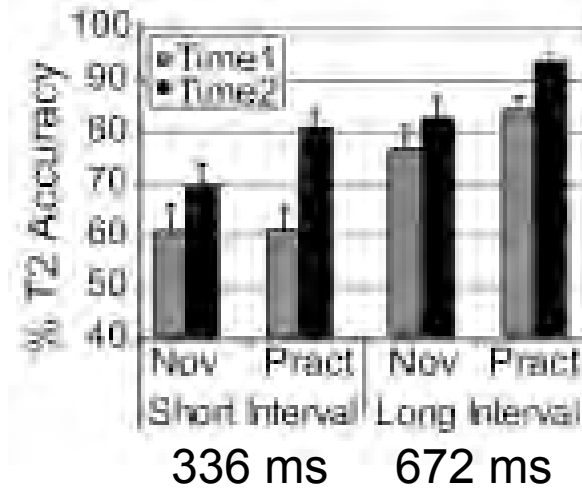


Figure 4. The Ability to Accurately Identify T2 Depends upon the Efficient Processing of T1

# Our Context



## The Big Us

# We are not separate from our context

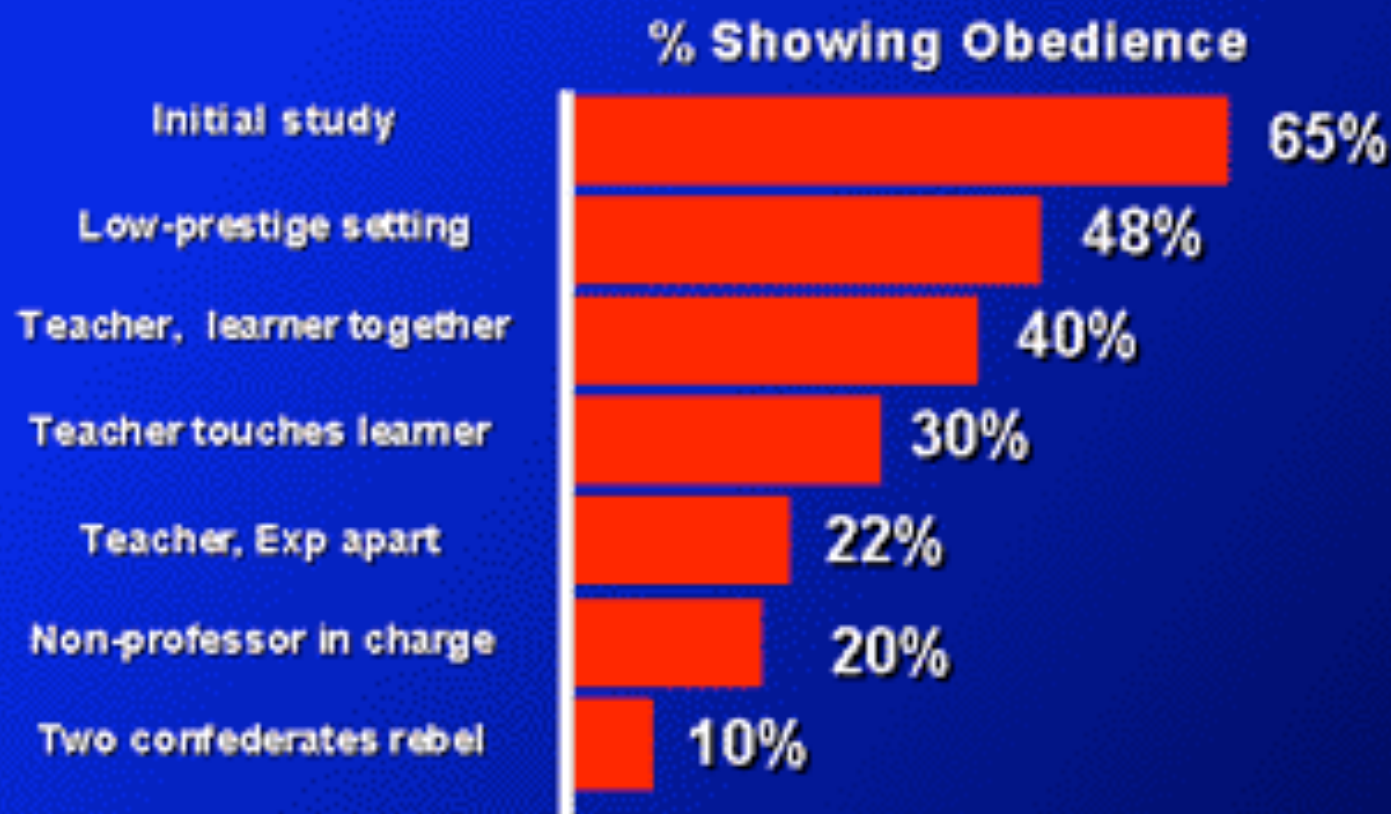
- Depleting fishery (resource dilemma task)
- 10/30 words on sentence completion task either cooperation or neutral words
- Those primed subliminally for cooperation = those with conscious cooperation goal > neutral words for fish returned to common resource



# Stanford Prison Experiment

- Participants randomly assigned to “prisoner” or “guard” roles in mock prison setting
- Study prematurely terminated “when it became apparent that many of the ‘prisoners’ were in serious distress and many of the ‘guards’ were behaving in ways which brutalized and degraded their fellow subjects”
- “Volunteer prisoners suffered physical and psychological abuse...while volunteer guards were exposed to the new self-knowledge that they enjoyed being powerful and had abused this power to make human beings suffer.”

# Milgram's Obedience Studies





# True neurally. Mirror Neuron System


- Observing an action = Doing that action
- Experiencing disgust & observing someone's disgust both activate anterior insula (Wicker, Keysers, et al., 2003, Neuron)
- Empathy: to put oneself in the place of others





# Empathy, Compassion, & Fairness

- Empathy: High functioning autistic individuals have less activation in MNS areas than controls when imitating emotional facial expressions (Depretto, et al, 2006, Nat Neurosci)
- Compassion: AC & Anterior insula activate when partner feeling pain (Singer, et al., 2004, Science)
- Fairness: AC & Anterior insula activated when neuroeconomic games are played fairly or not (Singer, et al., 2006, Nature)

An aerial photograph showing a diverse landscape. In the top left, there's a large, open field with some trees. To its right is a rectangular field divided into sections, some green and some brown. Below the top left field is a dense line of trees. In the bottom left, there's a large area divided into many small, rectangular plots, some of which are green and others are brown. To the right of this is a residential area with several houses and a parking lot. The text labels are overlaid on the image in white boxes with black borders.


5-acre prairie  
restoration

5-acre organic CSA farm

Community Gardens  
5 acres (320 plots)

Troy Co-housing  
30 units, mixed income



- 
- An aerial photograph of a residential development featuring a cluster of houses with grey roofs and colorful siding (red, blue, and white). The houses are arranged around a central green space. Several houses have solar panels installed on their roofs. A paved road with a parking lot is visible at the bottom. A white text box with a black border is overlaid on the left side of the image, containing a list of features.
- Interpretive trail
  - Restored woodland
  - Hmong herb garden
  - Edible landscaping

# Troy Co-housing

- Lifespan design
- Universal design
- Green space
- Promote community
- Green built & energy star
- Low operating costs
- Affordable: 20 (of 30) units permanently at affordable housing rates
- 2007 Livable Community Award from AARP & NAHB






# Ecovillage at Ithaca, NY



Song (30 houses)

Frog Common House

Frog (30 houses)

- 
- 800, 1000, 1200, 1500 sq ft
  - Resources = ~14 acres/person (EF 1.0)
  - 25 acres = avg (EF 1.0; 56% of avg American)

# Sharing...

- Meals
- Childcare
- Cars?
- Financing to increase renewables?
- Homes to increase density?
- Largest obstacles?
  - Intending to change
  - Emotional reactivity prevents getting along

# Getting along requires that...

(A) Everyone do it our way

(B) We learn to be non-reactive so we can...

- Pay attention to others by paying attention to ourselves
- Communicate well with people who annoy us, drive us crazy, etc.





# Maximize sustainable well-being

- Be fully human right here, right now
- Listen to the canary
- Lean in to a more sustainable lifestyle
- With others
  - Very challenging
  - Requires non-reactivity
  - & time
  - & forms
  - & ...



# The Big Us



sustainable**wellbeing**.org

Thank you

- Greg Reeb
- Rizwan Ahmad