

- "You'll learn so much, and laugh along the way" Review by Tibi Puiu, from ZME Science, November 25, 2015
- Psychology Book of The Month website All About Psychology, January 2016
- E-Book of The Month Stanford University Falconer Biology Library, April 2016

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### The Biased Mind

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# Outline of the presentation

### Warming up with warning signs

Our mind is the product of natural selection

How to frame messages for better communication

More on the biased mind



























Why is the point-down red triangle the most powerful warning sign?

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Why is the point-down red triangle the most powerful warning sign?



- Point down evokes unstability due to gravity
- Cutting edges embody the etymology of the word risk

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Red color triggers attention and alert

# Shapes can convey unstability and risk



The point-down triangle is the most preferred warning shape, followed by the diamond and then the octogon

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Shapes that appear unstable are preferred as warnings, striking our bodily sensitivity to Earth's gravity

[Lesch, Rau, Zhao, and Liu, 2009]

# The etymology of risk provides enlightning insight



Wreck of the Minotaur (Joseph Mallord William Turner, 1793)

- Likely etymology: Greek navigation term *rhizikon*, *rhiza*
- Latin resicum, risicum, riscus: cliff, récif
- "What cuts", reef, danger for sailors
- Risk is related to the uncertainty attached to the first sea travels carrying merchandise and to insurance (average comes from avaria)

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Colors propel risk perception to various degrees

Red is perceived to be more hazardous or urgent than other colors



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Black, red and orange are the "top three" colors associated with hazards both in China and in the USA

### Red lies at the end of the visible spectrum



In *The Adapted Mind*, [Barkow, Cosmides, and Tooby, 1992] Roger N. Shepard recalls that

> the overall (400 to 700 nm) range of spectral sensitivity of the human eye has long been regarded as an evolutionary accommodation to the range of solar wavelengths that reach us through the earth's atmosphere

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(...) most languages have terms that native speakers apply to colors in the very same regions of color space for which we use the words red and green

# Red sunset triggered vigilance at the coming of darkness



- As red marks the sunset and the coming of darkness, the color red certainly triggered attentiveness
- With poor nocturnal vision, humans had to look for a safe place for the night to shelter from predators
- This might be one of the reasons for which red is the color that most evokes risk

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Where do we stand? And what comes next?

- The warning sign example illustrates how our perceptions of risk are largely shaped by how we had to assess potential dangers in the wild
  - ▷ setting sun reddening alert
  - ▷ cutting fang of dangerous animals (snakes)
- We display innate dispositions and biases, and the better we know them, the better we can design efficient warning signs and, more generally, the better we can communicate

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More on the biased mind

As appetizers, here is handful of human biases

- Children fear more snakes, lions, and tigers than electric socket or cars, and have innate preferences for savanna-type landscape
- Sounds with increasing intensity seem closer
- Sex differences in mating attitudes
  - ▷ Men overperceive women neutral signals as sexual advances
  - ▷ Women are choosy
- We crave for sugar (and their derivatives, like alcohol). Why?
  ... Because vegetals manipulated animals
  to eat their (colored, sweet, savory) fruits
  and to disperse their seeds by defecation

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Warming up with warning signs

### Our mind is the product of natural selection

### Are we prisoners in time? The adapted mind

Our mind holds a myriad of problem-solving modules Our mind holds old age departments Our mind devices are tuned like a fire-detector We look after clues in our environment

### How to frame messages for better communication

It pays to frame problems as social contracts issues Use our aversion to losses to frame messages Communicating proportions and probabilities Metaphorical framing. Visual framing

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# At fifteen, I became an evolutionist, and it all became clear



At fifteen, I became an evolutionist, and it all became clear We came from mud And after 3.8 billion years of evolution, at our core is still mud Nobody can be a divorce lawyer and doubt that

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Gavin (Danny DeVito) in The War of the Roses (movie, 1989)

# A little story illuminating how evolution proceeds by natural selection

- Two little dinosaurs are running as fast as they can, chased by a large T. Rex
- They are both exhausted and one says to the other: "Why bother running fast? We are stupid, it's hopeless, there's no way we can outrun a T. Rex"

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The other answers:

"I'm not trying to run faster than the T. Rex, I'm trying to run faster than you!"

# We share the same brain as our close ancestor who painted in the caves



Pech Merle cave paintings

200 000 years
 of Superior Paleolithic
 have shaped our brain

Hence, as the biologist George C.
 Williams said:

"Is it not reasonable to anticipate that our understanding of the human mind would be aided greatly by knowing the purpose for which it was designed?"

 For instance, our ancestors had to avoid predators

# Young children fear wild animals more than cars



- Psychologist Adah Maurer's studied Chicago children fears
- almost all the 5- and 6-year-olds schoolchildren mentioned wild animals (most frequently snakes, lions, and tigers) in response to the question "What are the things to be afraid of?"
- "they do not (...) fear the things they have been taught to be careful about",
   say electric socket or cars

Evolutionary psychologists Cosmides and Tooby put forward the "multimodular mind" hypothesis



[Barkow, Cosmides, and Tooby, 1992]

- Avoiding predators was one among many problems that our ancestors had to solve, like searching for a mate, looking for food, etc.
- There can be no general problem-solving device, because there is no such thing as a general problem
- Hence, as our body is made of different functional parts, our mind hosts a bunch of problem-solving devices

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# The mind as a Swiss army knife



# Gerd Gigerenzer compares the mind to

 $\Rightarrow$  an adaptive toolbox of heuristics

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We often observe clashes between our mental devices

When People Behave Against Their Better Judgment Veronika Denes-Raj and Seymour Epstein (1994)

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Which of both "urns" would you choose if I offer you 1\$ if you draw a red "bean"?





#### 1 out of 10

8 out of 100

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# The larger bowl "looked more inviting"



When offered a chance to win \$1 by drawing a red jelly bean from a transparent plastic bowl

- 54% of the subjects prefered
  9 red beans among 100
  than 1 red bean among 10
- 34% of the subjects prefered
  5 red beans among 100
  than 1 red bean among 10

"they felt they had a better chance when there were more red beans" [Denes-Raj and Epstein, 1994]

## Subjects reported that...

- Subjects commonly commented that in spite of the stated odds, they felt that they had a better chance of winning by picking from the bowl with the more win- ning (red) beans.
- "I picked the ones with the more red jelly beans because it looked like there were more ways to get a winner, even though I knew there were also more whites, and that the percents were against me."
- A few acknowledged that, despite knowing this, the large bowl looked more inviting, and they had to fight the temptation to make nonoptimal choices
- People commonly report a conflict between two beliefs, one that they identify as rational or objective, and that reflects their understanding of objective probabilities, and another that they identify as irrational (about which they are often apologetic), but which most find more compelling

Do we have multiple selves?

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### A Ulysses pact is a pact between two selfs



- Dumbeldore begging Harry Potter to have him drink a malefic liquid
- In 2011, the US Congress trying to find means to force itself to commit to reducing State spendings
- Who is sovereign, the self who sets the alarm clock to rise early, or the self who shuts it to the next morning and goes back to sleep? [Loewenstein and Thaler, 1989]

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### Here are examples of our mental devices

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# What do you see?



# We have mental organs as we have body organs

#### body

- 🗢 lungs
- 🧼 heart
- 🗢 immune system
- 🗢 members
- 🧼 eyes

### mind

- $\Rightarrow$  face recognition
- 🗢 mate searching
- → food searching
- 🗢 predator avoidance
- 🗢 cheater detection

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Modules: specialized circuits, dedicated mini-computers, Darwinian algorithms, mind gadgets, apps

# Our mind holds hundreds or thousands of specialized cognitive adaptations



- Evolutionary Psychology: The New Science of the Mind
- → David Buss [Buss, 2014]
- How have our mental organs been shaped by natural selection?

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# Our mind houses natural mental categories

# STEVEN MITHEN THE PREHISTORY OF THE MIND



A SEARCH FOR THE ORIGINS OF ART, RELIGION AND SCIENCE

"An accessible, very well written, provocative and most valuable book"

Lewis Wolpert, OBSERVER

"Three phases for the evolution of the mind" [Mithen, 1998, p.69]

- 1. general intelligence
- 2. specialized isolated modules regrouped in departments
  - general intelligence
  - technical intelligence
  - natural history intelligence

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- social intelligence
- ⊳ language
- 3. cognitive fluidity, team of modules
## Our mind holds hard-wired categories





## Here are natural ontological categories



ontological categories [Boyer, 2001, p.115]

- 🗢 animal
- 🗢 artefact
- 🧼 person
- 🤿 plant
- 🗢 natural object

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🗢 number

## Categories trigger hard wired inference engines

Category	Inference engine
inert object	intuitive physics
(artefact, natural object)	
mobile living object	intuitive psychology
(animal, person)	intentional stance (agent)
	goal detection
artefact	function detection, use mode

Mixed category	Inference engine
body parts	structure-function system
corpses, rotten	contagion

## Hard wired social inference engines make cooperation and social life possible

Inference engine	Effect	
cheater detection	makes cooperation possible	
	without free-riders	
emotional system	prioritizing decisions,	
	strategies in the reciprocity game	
moral system		
trading accounting system	keeps track of costs and benefits	
"essence" system	coalition, "groupism"	
intentional agent	from predator avoidance	
behind events	to seeing plots everywhere	

Crossing intuitive ontological boundaries

[Boyd, Carroll, and Gottschall, 2010, p.441]

- Supernatural concepts refer to an ontological category, but display features that limitedly violate intuitive expectations [Boyer, 2001, p.94-95]
- This makes their features more memorable [Boyer, 2001, p.118]
- Especially when only one violation [Boyer, 2001, p.127]

Marketing application:

create product names that cross the intuitive boundaries of natural ontological categories, but with only one violation of expectations

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#### Book titles that cross intuitive ontological boundaries

→ The Selfish Gene / Le Gène Egoïste, Richard Dawkins

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- → La Montagne Magique, Thomas Mann
- *→ Le Bateau Ivre*, Arthur Rimbaud

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## Sounds with increasing intensity seem closer



- Auditory looming: sounds with increasing intensity seem closer
- Converging evidence suggests that perceivers underestimate the time-to-impact of approaching sounds

## Theoretical explanation: anticipating predator approaching [Neuhoff, 1998]

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#### Fire detectors are biased toward false alarms

	fire	no fire
alarm		"false alarm"
(positive P)	true positive (TP)	false positive (FP)
no alarm	"miss"	
(negative N)	false negative (FN)	true negative (TN)

- In hazard detection,
  - ▷ true negatives (misses)
  - $_{\triangleright}\;$  are often much more costly than
  - false positives (false alarms)

→ Hence, hazard detectors are often biased toward false alarms

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Errors asymmetrical in costs induce biases

The life-dinner principle (Richard Dawkins [Dawkins and Krebs, 1979])

> "The rabbit runs faster than the fox, because the rabbit is running for his life while the fox is only running for his dinner"

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"A healthy dose of paranoia can keep you alive in this business"

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Henrietta "Hetty" Lange (portrayed by Linda Hunt) Operations Manager at NCIS in Los Angeles (Season 3, Cyber Threat)

#### The paranoid optimist is tuned like a fire detector

The paranoid optimist [Haselton and Nettle, 2006]

- → You walk back to your tribe camp after hunting
- You see the grass moving ahead of you
- → What to believe?
  - ⊳ snake?
  - ▷ no snake?
- Natural selection favored those Homo Sapiens with a bias towards false alarm

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#### Better treat a stick as a snake than the reverse!



The illusion of animacy

# Better believe there's an agent behind an event because missing an agent may be lethal

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Extract from CSI Las Vegas episode "Go to Hell"

"Grissom, do you believe in a separate, living evil?"

Crime scene investigator Gil Grissom answers:

"You're primitive man on the savannah.

You see something move out of the corner of your eye. You assume it's a hyena.

You run, you live.

If you assume it's the wind and you're wrong, you die. We have the genes of the ones who ran.

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We're genetically hardwired to believe living forces that we cannot see."

## Religion Explained The Evolutionary Origins of Religious Thought



- Religion Explained: The Evolutionary Origins of Religious Thought
- → Et l'homme créa les dieux
- → Pascal Boyer [Boyer, 2001]

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#### Many differences in relations between men and women also result from reproductive cost asymmetries

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#### The "Coolidge effect"

Or how men have reproductive interest in having multiple and casual sex

- President Coolidge and his wife were touring a farm
- While the President was elsewhere, the farmer proudly showed Mrs. Coolidge a rooster that "could copulate with hens all day long, day after day"
- Mrs. Coolidge coyly suggested that the farmer tell that to Mr. Coolidge, which he did
- The President thought for a moment and then inquired, "With the same hen?"

- → "No, sir," replied the farmer
- → "Tell that to Mrs. Coolidge," retorted the President

Men overperceive women neutral signals as sexual advances

- [Haselton and Buss, 2000] claim that the documented tendency for men to overestimate women's sexual intent could be an adaptive bias designed by natural selection
- Men produce millions of sperm, replenished at a rate of roughly 12 million per hour: there is no end to men reproductive success
- Because men's reproduction is limited primarily by the number of sexual partners to whom they gain sexual access,
- A bias that caused men to err on the side of assuming sexual interest would have resulted in fewer missed sexual opportunities, and hence greater offspring number, than unbiased sexual inferences
- Therefore, natural selection should favor sexual overperception in men

## Women are choosy (comen a la carta)

- Women's gestation and breastfeeding is the bottleneck to reproductive success: about 400 ovulations, 9 months gestation + breastfeeding (up to 4 years); about 12 children at the maximum, whatever the number of sexual partners
- Imagine a female trying to detect whether a male is willing to make a significant postreproductive investment if she mates with him
- A "false negative" (not mating, though man willing) involves missing out on it, so the opportunity cost is significant
- However, the value of the "false positive" is potentially higher (very costly), because if she mates and then is deserted, she faces the possibility of raising an offspring alone and may have trouble finding another partner in the future
- → Hence, women are choosy

Natural selection shaped female and male psychologies in various fields

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## Hypothesis: evolutionary origins for a football bias?

#### football

- 🗢 male teams
- locate partners and opponents on large distances
- 🗢 run and move quickly
- collaborate and coordinate by movements
- 🗢 not much talking

hunting and fighting enemy groups

🗢 male teams

- locate friends and foes on large distances
- → run and move quickly
- collaborate and coordinate by movements
- not much talking (not to alert prey or enemy)

Empirical facts: males surpass females in throwing abilities, and use directional cues (routes, roads) for orientation [Baron-Cohen, 2004, p.78-79]

## Hypothesis: evolutionary origins for a shopping bias?

shopping

- 🗢 women go shopping together
- 🗢 clothes touching
- → sensitivity to colors
- talking and information exchange

gathering

- women go gathering together
- 🗢 fruit and berries touching
- sensitivity to colors (fruit maturity)
- relative location of fruit and berries

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Empirical facts: females surpass males in remembering the relative location of objects, and use specific landmark cues (signposts) for orientation [Baron-Cohen, 2004, p.78-79]

## Sex differences

Sex differences in mating attitudes

- ▷ Men overperceive women neutral signals as sexual advances
- ▷ Women are choosy
- → Sex differences in spatial abilities
  - ▷ Females surpass males in recollection of objects
  - Males are better at wayfinding
- Sex differences in coulours perception
  - Men see the world in the standard three basic colours: red, blue, green
  - About one third of women see the world in four basic colours: red, blue, green + extra shade of green or red correlated to the amount of bare facial skin in primates? [Dunbar, 2010, p.17-18]

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## Optical illusion The half-spheres are protuberant or in hollow?



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## Natural light, the sun, comes from above

- Gerd Gigerenzer claims that we can learn from that perceptual illusion how our mind functions
- Our mind recalls that natural light comes from above (in relation to retinal coordinates), and that there is only one source of light, the sun
- If the shade is in the upper part, then the dots are concave; if the shade is in the lower part, then the dots are convex
- Seeing is more scanning than contemplating

#### My mind restores missing speech sound

Warren, R.M. Perceptual restoration of missing speech sounds. Science, 1970, 167, 392-393

- → "It was found that the wheel was on the axle"
- arphi "It was found that the  $(\cdots)$ eel was on the axle" o wheel
- arphi "It was found that the  $(\cdots)$ eel was on the orange" o peel

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# Language is an instinct (Steven Pinker) and a collaborative tool



Steven Pinker [Pinker, 1994]

- → "John tried to clean his room"
- → "I went to the cinema yesterday"

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#### Watch the borders!

- Edgar J. Hoover was the Director of the Federal Bureau of Investigation (FBI) of the United States
- In the book, No Left Turns: The FBI in Peace and War (1975), former agent Joseph L. Schott portrays Hoover as a rigid, paranoid old man who terrified everyone
- On the FBI website, you find the following anecdote about the "blue gems"
- $\rightleftharpoons$  Hoover liked to write on the margins of memos
- One day, his staff received an annotated memo with the warning "watch the borders!"
- Inquiries were sent to the Border Patrol about any strange activities on the Canadian and Mexican frontiers
- It took a week before someone understood the message related to the borders of the memo paper: the text had simply overflowed in the margin!

## Where do we stand? And what comes next?

- Our mental biases drive us in awkward directions, quite unconsciously
- → Evolutionary rationality transpires behind our mental biases

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- → Our mind is modular
- Knowing our biases can help us better communicate and interact

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Tips to make sound decisions. Experts Immoral risks outrage individuals Miscellaneous Our mind hosts a cheater-detection module [Cosmides and Tooby, 1992]

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## The Wason cards are a famous brainteaser



From Wikipedia

- You are shown a set of four cards each of which has
  - ▷ a number on one side
  - ▷ a color on the other side
- The visible faces of the cards show 3, 8, red and brown
- Which card(s) must you turn over in order to test the truth of the proposition that

#### 🗢 if a card

shows an even number on one face, then its opposite face is red?

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🗢 8 and brown
Now, consider the reformulation of the Wason cards as a cheater detection task

[Cosmides and Tooby, 1992], [Pinker, 1997]

- $\rightleftharpoons$  You are a bouncer in a bar, and are enforcing the rule
- $\Rightarrow$  "If a person is drinking beer, he must be eighteen or older"
- $\rightleftharpoons$  You may check what people are drinking or how old they are

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- → Which do you have to check:
  - ⊳ a beer drinker
  - ▷ a Coke drinker
  - a twenty-five-year-old
  - ▷ a sixteen-year-old?

Now, consider the reformulation of the Wason cards as a cheater detection task

[Cosmides and Tooby, 1992], [Pinker, 1997]

- $\rightleftharpoons$  You are a bouncer in a bar, and are enforcing the rule
- $\Rightarrow$  "If a person is drinking beer, he must be eighteen or older"
- $\Rightarrow$  You may check what people are drinking or how old they are

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- → Which do you have to check:
  - ▷ a beer drinker
  - ▷ a Coke drinker
  - ▷ a twenty-five-year-old
  - ▷ a sixteen-year-old?
- → Most people correctly select
  - ▷ the beer drinker
  - $\triangleright$  and the sixteen-year-old

To help convey the notion of Pareto optimum, frame it as a "social contract"

At a Pareto optimum,

no agent has interest in changing his basket of goods

- $\Rightarrow$  An allocation is a collection of baskets of goods, one by agent
- $\Rightarrow$  An allocation  $A^{\flat}$  is dominated by an allocation  $A^{\sharp}$  if
  - ▷ all agents either strictly prefer  $A^{\sharp}$  to  $A^{\flat}$ , or are indifferent between  $A^{\sharp}$  and  $A^{\flat}$
  - $\triangleright$  at least one agent strictly prefers  $A^{\sharp}$  to  $A^{\flat}$
- An allocation is feasible if the sum of all goods is less than or equal to the total of goods in the economy

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An allocation is a Pareto optimum if it is not dominated by a feasible allocation To help convey the notion of Pareto optimum, frame it as a "social contract"

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You cannot rob Peter to pay Paul

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# Outline of the presentation

Warming up with warning signs

Our mind is the product of natural selection

Are we prisoners in time? The adapted mind Our mind holds a myriad of problem-solving modules Our mind holds old age departments Our mind devices are tuned like a fire-detector We look after clues in our environment

#### How to frame messages for better communication

It pays to frame problems as social contracts issues

#### Use our aversion to losses to frame messages

Communicating proportions and probabilities Metaphorical framing. Visual framing

#### More on the biased mind

Tips to make sound decisions. Experts Immoral risks outrage individuals Miscellaneous

### Loss aversion and Samuelson's colleague

- Economist Paul Samuelson once offered a colleague the following bet:
   flip a coin, heads you win \$200 and tails you lose \$100
- Samuelson reports that his colleague turned this bet down on the rationale that
- "I won't bet because I would feel the \$100 loss more than the \$200 gain "
- This sentiment is the intuition behind the concept of loss aversion [Kahneman and Tversky, 1974],

"There are twice as many negative emotions (fear, grief, anxiety, and so on) as positive ones" [Pinker, 1997]

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A proper framing can improve the impact of communication

> You can gain several potential health benefits by spending only five minutes each month doing breast self-examination

> > $\wedge$

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You can lose several potential health benefits by failing to spend only five minutes each month doing breast self-examination A proper framing can improve the impact of communication

> You can gain several potential health benefits by spending only five minutes each month doing breast self-examination

> > $\wedge$

You can lose several potential health benefits by failing to spend only five minutes each month doing breast self-examination

Subjects who read a pamphlet with arguments framed in loss language manifested more positive breast self-examination attitudes, intentions, and behaviors (57% > 38% at the 4-month follow-up) [Meyerowitz and Chaiken, 1987]

# Kahneman and Tversky value function



Figure : Kahneman and Tversky value function

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Concavity for gains / Convexity for losses

[Thaler, 1985]

- $\rightleftharpoons$  Concavity for gains
  - $_{\triangleright}\,$  We prefer multiple small gains to one larger gain
  - ▶ Moral: do not wrap all the Christmas presents in one box!
  - Adding options to an automobile or house purchase are classic, well-known examples in sale techniques

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Concavity for gains / Convexity for losses

#### [Thaler, 1985]

- $\Rightarrow$  Concavity for gains
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  - ▶ Moral: do not wrap all the Christmas presents in one box!
  - Adding options to an automobile or house purchase are classic, well-known examples in sale techniques
- Convexity for losses
  - $_{\triangleright}\,$  We prefer to pay once in for all than many small debts/losses

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Moral: do not present the bills one after the other!

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# $0.1 \neq 10\% \neq 1/10 \neq 10/100 \neq \frac{10}{100} \neq \frac{1}{10}$



Priya Raghubir,

The effet of denominator salience on perceptions of base rates of health risk, Int. J. of Research in Marketing, 2008 [Raghubir, 2008]

Isaac Lipkus,

Numeric, Verbal, and Visual Formats of Conveying Health Risks Med Decis Making, 2007 [Lipkus, 2007]

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Three formats for the same problem Some speak more to the (biased) mind than others

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The medical diagnosis problem is a famous example where mathematical reasoning can be deficient

[Casscells, Schoenberger, and Graboys, 1978]

"If a test to detect a disease whose prevalence is 1/1000 has a false positive rate of 5%, what is the chance that a person found to have a positive result actually has the disease, assuming that you know nothing about the person's symptoms or signs?"

- Only 18% of Harvard medical school students and staff answered the correct Bayesian answer: "2%"
- $\Rightarrow$  45% of them answered "95%"

Here is a frequentist formulation of the medical diagnosis problem

Are humans good statisticians after all? [Cosmides and Tooby, 1996]

- → 1 out of every 1000 Americans has disease X
- A test has been developed to detect when a person has disease X
- Every time the test is given to a person who has the disease, the test comes out positive (i.e., the "true positive" rate is 100%)
- But sometimes the test also comes out positive when it is given to a person who is completely healthy
- Specifically, out of every 1000 people who are perfectly healthy, 50 of them test positive for the disease (i.e., the "false positive" rate is 5%)

56% gave the correct answer

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Presenting information in frequency formats helps improve Bayesian reasoning

By analyzing several thousand solutions to Bayesian problems, Gigerenzer and Hoffrage found that

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- $\Rightarrow$  when information was presented in frequency formats
- statistically naive participants derived up to 50% of all inferences

[Gigerenzer and Hoffrage, 1995]

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### Metaphors we live by



[Lakoff and Johnson, 1981]

#### 🧢 Ideas are

- cutting instruments: incisive, cutting, sharp
- light-sources: insightful, illuminating
- ⊳ food:

digest, swallow, devoured, warmed over, food for thought, meaty part

- Knowledge: unknown is up, known is down
  - ▷ that question is still up in the air
  - ▷ that settles the question
  - ▷ it's still up for grabs
  - let's bring it up for discussion

## The embodied mind

Or how we grasp abstract concepts in bodily terms

#### When someone reads grasping the idea, zones corresponding to the physical action of grasping are activated in the premotor cortex of the left hemisphere, grabbing more attention than understanding the idea

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## We think with images

- Thought is made largely from images, which include symbolic representations like somatic markers
- Marked by positive or negative feeling, through lifetime experience
- → Negative marker of an image of a future outcome: alarm

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[Damasio, 1995]

## "I know a Brazilian man who..."



- Emotion arises as a reaction of mental images
- Warnings more efficient when based upon people and anecdotes than statistics:
   "I because Described mean when
  - "I know a Brazilian man who..."

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### Sinuous snakes haunt our minds









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Miscellaneous
Use experts for what they are good at: quickly extracting the right features in a messy situation

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### Knowing exactly where to tap

In his book *59 Seconds: Change Your Life in Under a Minute*, Richard Wiseman tells a very old story, often used to kill time during training courses

- A man is trying to fix his broken boiler, but fails despite his best efforts
- He decides to call in an engineer, who simply gives one gentle tap on the side of the boiler and instantly brings it back to life
- The engineer presents the man with a bill, and the man argues that he should pay only a small fee as the job took the engineer only a few moments
- The engineer quietly explains that the man is not paying for the time he took to tap the boiler but rather the years of experience involved in knowing exactly where to tap

An anecdote with painter Pablo Picasso "It took me forty years to get there"

- A woman approached Picasso in a restaurant and asked him to scribble something on a towel
- $\rightleftharpoons$  She claimed she was ready to pay whatever he asked

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- Picasso complied and said:
  "It will be ten thousand dollars"
- "But you did it in thirty seconds!" answered the amazed woman
- "No", said Picasso,
  "It took me forty years to get there"

Do *not* use experts to integrate information they have extracted Prefer a linear model

The "Moral Algebra" with +1 and -1

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# Darwin's Marry / Not Marry: "This is the question"

#### Marry



Children – (if it Please God) – Constant companion, (& friend in old age) who will feel interested in one, – object to be beloved & played with. – –better than a dog anyhow. – Home, & someone to take care of house – Charms of music & female chit-chat. – These things good for one's health. – Forced to visit & receive relations but terrible loss of time. –

W My God, it is intolerable to think of spending ones whole life, like a neuter bee, working, working, & nothing after all. – No, no won't do. – Imagine living all one's day solitarily in smoky dirty London House. – Only picture to yourself a nice soft wife on a sofa with good fire, & books & music perhaps – Compare this vision with the dingy reality of Grt. Marlbro' St.

Marry – Marry – Marry Q.E.D.

# Darwin's Marry / Not Marry: "This is the question"



No children, (no second life), no one to care for one in old age.- What is the use of working 'in' without sympathy from near & dear friends-who are near & dear friends to the old, except relatives Freedom to go where one liked – choice of Society & little of it. – Conversation of clever men at clubs - Not forced to visit relatives, & to bend in every trifle. - to have the expense & anxiety of children - perhaps quarelling - Loss of time. - cannot read in the Evenings – fatness & idleness – Anxiety & responsibility – less money for books &c – if many children forced to gain one's bread. - (But then it is very bad for ones health to work too much) Perhaps my wife wont like London; then the sentence is banishment & degradation into indolent, idle fool -

One subject decided to get a divorce after realizing that she was fighting more than loving

[Dawes, 1982]

- Researchers at the University of Oregon attempted to predict self rating of marriage happiness
- They showed that a crude improper linear model marriage happiness = rate of lovemaking — rate of fighting could judge such a complex concept as marital happiness
- $\Rightarrow$  The conclusion is that
  - ▷ if we love more than we hate, we are happy
  - ▷ when we hate more than we love, we are miserable

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Tips to make sound decisions. Experts Immoral risks outrage individuals Miscellaneous Outrage and moral factors have a substantial impact on risk perception

- Risk = Hazard + Outrage (Sandman)
- Reliance on outrage is the major reason that public evaluations of risk differ from expert evaluations (based on analysis of hazard, e.g., mortality statistics)

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# Adding a moral factor improves the explanatory value of risk perception

- With the factors novelty, dread, uncontrollable, catastrophic, etc., the psychometric model's explanatory value is only around 20% of the variance of raw data
- $\Rightarrow$  Adding a moral factor doubles the explanatory value:
  - unnatural risk
  - immoral risk
  - human arrogance
  - tampering with Nature
- Nuclear energy and GMO are see as transgressions, that evoke skin crossing by a cutting instrument

Factors in risk perception, Lennart Sjöberg [Söberg, 2000]

"We're not just breaking international laws, we're screwing with the laws of nature" (official trailer of the 2013 Helix TV series on virus outbreak)



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- Our mind was shaped by natural selection to solve adaptive problems
- Our brains were built for survival and reproduction (fitness), not for truth
- 🗢 Biases may appear
  - $_{\triangleright}\;$  when truth and fitness are not aligned
  - $_{\triangleright}\,$  when adaptive problems have changed (parasites, health)

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Our mental biases are mostly unconscious

### Our mental biases are mostly unconscious

- The time spent with the grandparent and the resources (gifts) they received from the grandparent
- depends whether
  - ▷ the grandparent is the fathers' father (less resources)
  - ▷ the grandparent is the mothers' mother (more resources)

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El hijo de mi hija, mi nieto ser; el hijo de mi hijo, no saber

# Inevitable luxury business



- Wasting is an honest signal of richness
- The peacock's tail was a challenge to Darwin: a product of sexual selection that is a handicap for survival
- Zahavi's paradox of the handicap

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# Inevitable gossip business



- It is unlikely that language evolved to communicate about "the bison by the lake"
- Indeed, producing a message is costly to the emitter, hence should be to his/her benefit [Dawkins and Krebs, 1979]
- Language evolved for gossip, to obtain information about group members, hence improving fitness

Self-promotion, nobody will do it for you ;-)



- What makes the number 7 so special?
- Why is it that the French eat snails but not slugs?
- Why is it better to whisper words of love into the left ear?

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Why is the image to the left, and the text to the right? More readings

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# On the Origin of Species



# The evolution of species comes from natural selection

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## The Descent of Man, and Selection in Relation to Sex



We are, however, here concerned only with that kind of selection, which I have called sexual selection. This depends on the advantage which certain individuals have over other individuals of the same sex and species, in exclusive relation to reproduction.

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## Darwin's Dangerous Idea Evolution and the Meanings of Life



*→* universal acid*→* cranes vs skyhooks

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## Adaptation and Natural Selection A Critique of Some Current Evolutionary Thought



[Williams, 1966]

Is it not reasonable to anticipate that our understanding of the human mind would be aided greatly by knowing the purpose for which it was designed?

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# The Selfish Gene



We are survival machines robot vehicles blindly programmed to preserve the selfish molecules known as genes. This is a truth which still fills me with astonishment.

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#### Sociobiology The New Synthesis



[Wilson, 2000]

fellows of the international Animal Behavior Society ranked "Sociobiology: The New Synthesis" the most important book on animal behavior of all time

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## Consilience The Unity of Knowledge



The greatest enterprise of the mind has always been and always will be the attempted linkage of the sciences and humanities. The ongoing fragmentation of knowledge and resulting chaos in philosophy are not reflections of the real world but artifacts of scholarship.

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# On Human Nature



[Wilson, 2004]

Can there be a more important subject than human nature? Human nature exists. composed of the complex biases of passion and learning propensities often loosely referred to as instincts. (...) scientific explanation embrace both the how (neurosciences) and why (evolutionary biology) of brain action (...)

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# Human Universals



(...) what we know about universals places clear limits on the cultural relativism that anthropologists have developed and disseminated widely

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## The Adapted Mind Evolutionary Psychology and the Generation of Culture



Evolutionary psychology is simply psychology that is informed by the additional knowledge that evolutionary biology has to offer, in the expectation that understanding the process that designed the human mind will advance the discovery of its architecture.

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[Barkow, Cosmides, and Tooby, 1992]

# The Prehistory of the Mind

A Search for the Origins of Art, Religion and Science

# STEVEN MITHEN THE PREHISTORY OF THE MIND



A SEARCH FOR THE ORIGINS OF ART, RELIGION AND SCIENCE

"An accessible, very well written, provocative and most valuable book"

Lewis Wolpert, Observer



In this book I intend to specify the 'whats', 'whens' and 'whys' for the evolution of the mind. While following its course I will be searching for — and will find — the cognitive foundations of art, religion and science.

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## The Mating Mind How Sexual Choice Shaped the Evolution of Human Nature



This book proposes that our minds evolved not just as survival machines, but as courtship machines. (...) I shall argue that the most distinctive aspects of our minds evolved largely through the sexual choices our ancestors made.

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### Evolutionary Psychology The New Science of the Mind



[Buss, 2014]

Evolutionary psychology provides the conceptual tools for emerging from the fragmented state of current psychological science and linking psychology with the rest of the life sciences in a larger scientific integration.

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# The Evolution of Human Sexuality



[Symons, 1979]

Men and women differ in their sexual natures because throughout the immensely long hunting and gathering phase of human evolutionary history the sexual desires and dispositions that were adaptive for either sex were for the other tickets to reproductive oblivion.

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# Mother Nature

Maternal Instincts and How They Shape the Human Species

A new vision of motherhood from one of the most brilliant social scientists of our day MOTHER NATURE MATERNAL INSTINCTS AND HOW THEY SHAPE THE HUMAN SPECIES

SARAH BLAFFER HRDY

[Hrdy, 1999]

Right from the outset of evolutionary thinking, however, a tiny group of women were as Darwinian as they were feminist. George Eliot, a woman who took a man's name because women writers at that time were not taken seriously, was one of them.

#### The Essential Difference Men, Women and the Extreme Male Brain



[Baron-Cohen, 2004]

The subject of essential sex differences in the mind is clearly very delicate. I could tiptoe around it, but my guess is that you would like the theory of the book stated plainly. So here it is: The female brain is predominantly hard-wired for empathy. The male brain is predominantly hard-wired for understanding and building systems.

# How the Mind Works





My goal was to weave the ideas into a cohesive picture using two even bigger ideas that are not mine: the computational theory of mind and the theory of the natural selection of replicators.

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#### The Blank Slate The Modern Denial of Human Nature



Finally, the denial of human nature has not just corrupted the world of critics and intellectuals but has done harm to the lives of real people. (...) The romantic notion that all evil is a product of society has justified the release of dangerous psychopaths who promptly murdered innocent people.
## The Language Instinct The New Science of Language and Mind



For although language is an instinct, written language is not.

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### The Sense of Style The Thinking Person's Guide to Writing in the 21st Century

HINKING PERSON'S GUIDE RITING in the 21st CENTURY GUAGE INSTINCT and THE BLANK SLATE [Pinker, 2014]

I am a psycholinguist and a cognitive scientist, and what is style, after all, but the effective use of words to engage the human mind?

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## Grooming, Gossip, and the Evolution of Language



I shall examine not only what we do with language but also the more fundamental questions of why we have it, whence it came and how long ago it appeared.

### Chimpanzee Politics Power and Sex Among Apes



[de Waal, 2007]

I also did not draw explicit parallels between how rival chimpanzees curry favor with females by grooming them and tickling their young and the way human politicians hold up and kiss babies, something they rarely do outside the election season.

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## Homicide



[Daly and Wilson, 1988]

This book is an exercise in "evolutionary psychology": the attempt to understand normal social motives as products of the process of evolution by natural selection. There is simply no question that this is the process that created the human psyche, and yet psychologists seldom ask what implications this fact might have for their discipline. We think that the implications are many and profound

### The Murderer Next Door Why the Mind Is Designed to Kill



Murder gives us an X-ray of the inner core of human nature. It lays bare the things that matter most to humans everywhere — the necessities of survival, the attainment of status, the defense of honor, the acquisition of desirable partners, the loyalty of our lovers, the bonding of our allies, the vanquishing of our enemies, the protection of our children. and the successes of the carriers of our genetic cargo.

[Buss, 2006]

# Despotism and Differential Reproduction

A Darwinian View of History

#### Despotism and Differential Reproduction

A Darwinian View of History

Laura L. Betzig



[Betzig, 2008]

"Much light will be thrown on the origin of man and his history" Darwin ended his Origin of Species with that prophecy. (...) In the first century after the Origin of Species, virtually no one tested Darwin's theory against the evidence of human history. In the last decade, that tide has changed; this book is caught up in it.

## The Biology of Moral Systems



Moral problems involve the interests of people, and biology gives good reasons for expecting different individuals to behave as if their interests are unique, and thus as if interests conflict among individuals to some degree almost all of the time.

## Religion Explained The Evolutionary Origins of Religious Thought



[Boyer, 2001]

L'esprit ne fonctionne donc pas comme une machine à "passer en revue tous les faits pour leur trouver une explication générale". Il se compose d'un grand nombre de dispositifs d'explication spécialisés, plus précisément nommé systèmes d'inférence, dont chacun est adapté à certains types d'événements précis et suggère automatiquement des explications à leur propos.

## Deceit and Self-Deception Fooling Yourself the Better to Fool Others





We are thouroughgoing liars, even to ourselves. Our most prized possession — language — not only strengthens our ability to lie but greatly extends its range. (...) But why self-deception? Why do we possess marvelous sense organs to detect information only to distort it after arrival? Evolutionary biology provides the foundation for a functional view of the subject

## The Nurture Assumption Why Children Turn Out the Way They Do



[Harris, 1998]

This is the second edition of The Nurture Assumption, but its message remains the same. The "experts" are wrong: parental nurturing is not what determines how a child turns out. Children are not socialized by their parents. The nurture assumption is a myth and most of the research used to support it is worthless. Diplomacy has never been my strong suit.

## The Consuming Instinct What Juicy Burgers, Ferraris, Pornography, and Gift Giving Reveal About Human Nature



[Saad, 2011]

My hope is that a greater number of consumer scholars in particular and business scholars more generally will eventually come to realize that human minds are the product of natural and sexual selection. In doing so, they will view evolutionary theory as a theoretical framework that can help them augment the explanatory power of their research (...)

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## Behavioral Genetics



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