

# THE BRAIN AND TECHNOLOGY

*Brain science in interface design*

## LESSON 1. ATTENTION

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With illustrations by Jasmin Whitworth

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# ATTENTION

What is important?



Attention is a  
**limited  
resource**

# PART 1. REALITY LEVELS

Different sciences recognize different system **reality levels**:

- **Mechanical systems** (hardware):
  - Physics, Engineering
- **Information systems** (software):
  - Computer Science, IT, IS, Informatics, Software Engineering
- **Psychological systems** (people):
  - Psychology, art, literature
- **Social systems** (groups, communities):
  - Sociology, political science, economics, history...

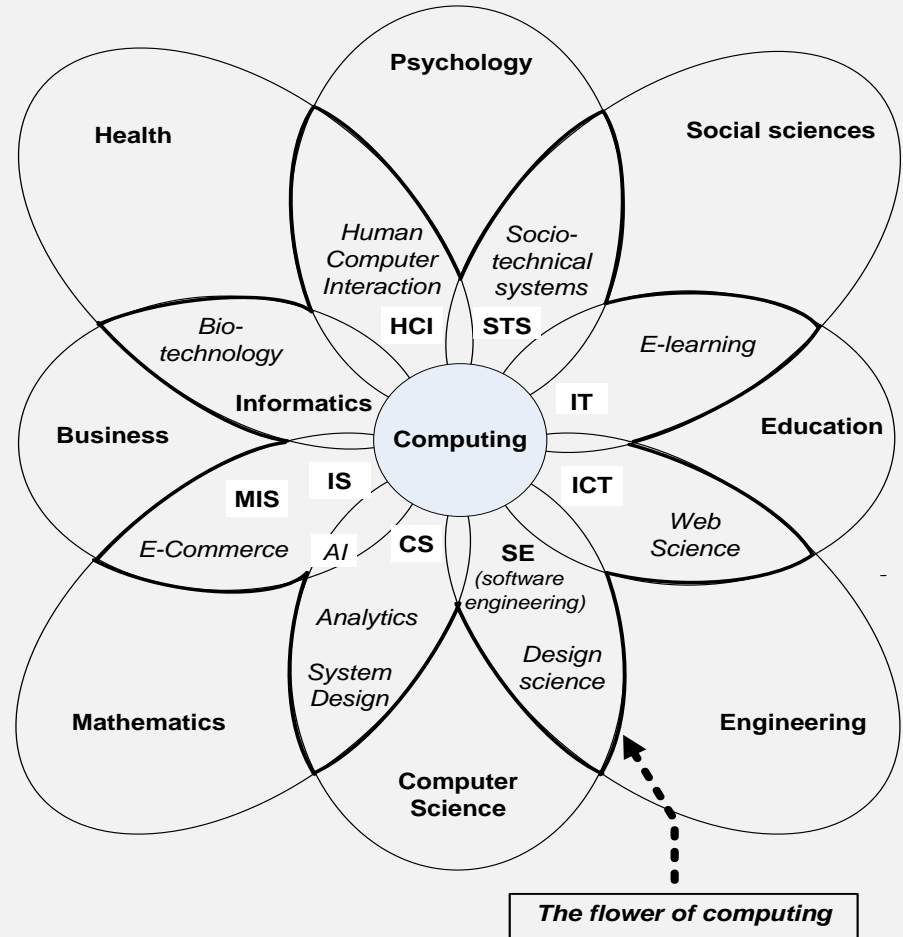


# THE FLOWER OF COMPUTING

Computing **evolved** from hardware to software to people to communities.

Computing **merged** with other fields to create the new disciplines of:

- **HCI**: Human computer interaction
  - Email, browser, Google, cell-phone
- **STS**: Socio-technical systems
  - Twitter, Facebook, Snapchat, Ebay



# THE EVOLUTION OF COMPUTING

Computing began as *hardware* (IBM), then became about *software* (Microsoft), then *personal* (Google), then *social* (Facebook), and today is about all four.



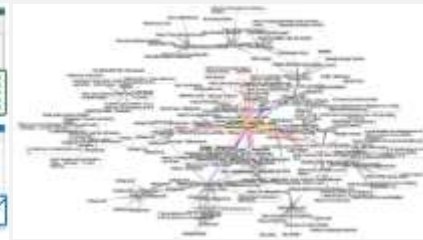
1' ENIAC (Electronic numerical integrator And Computer)



2' IBM Mainframe



3' Microsoft Office, OS



4' World-Wide-Web  
Google



5' Social Media

1950-60s

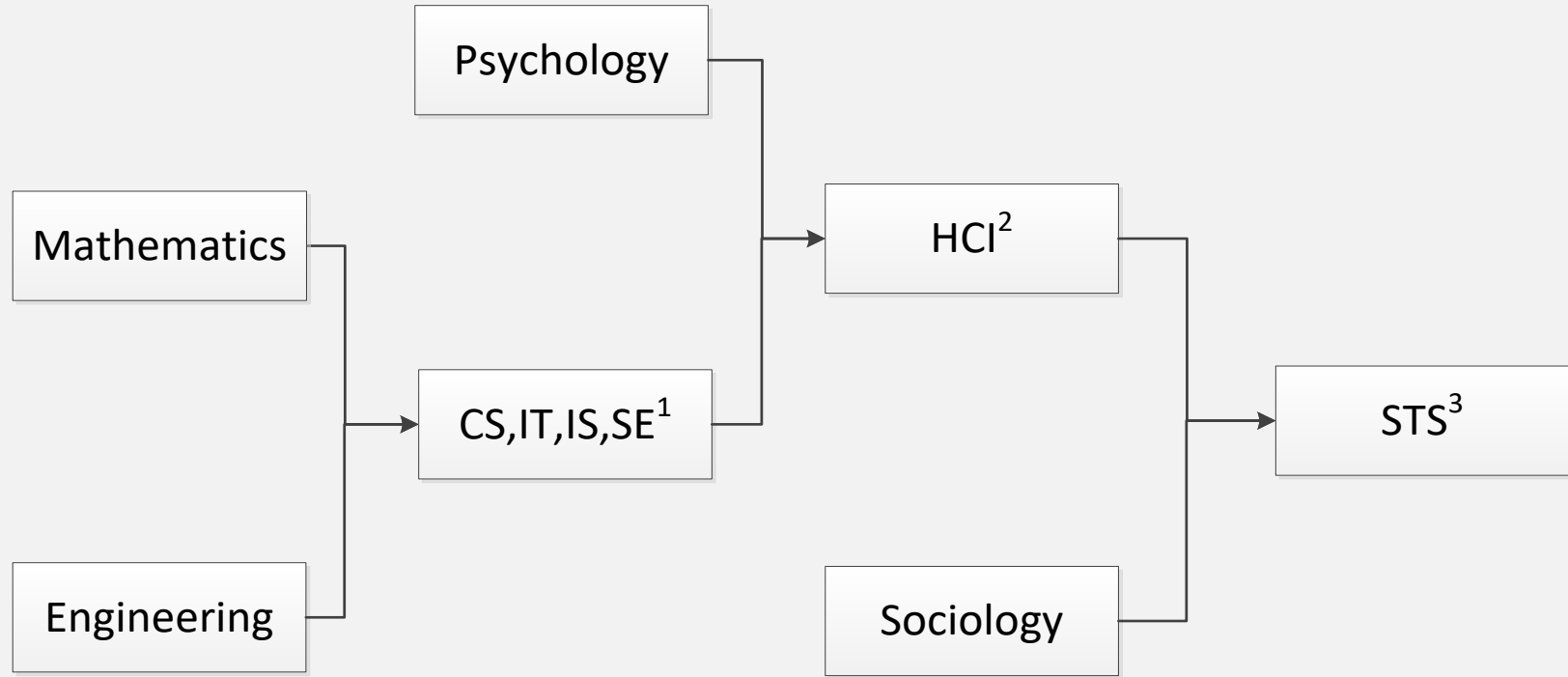
1970s

1980s

1990s

2000s

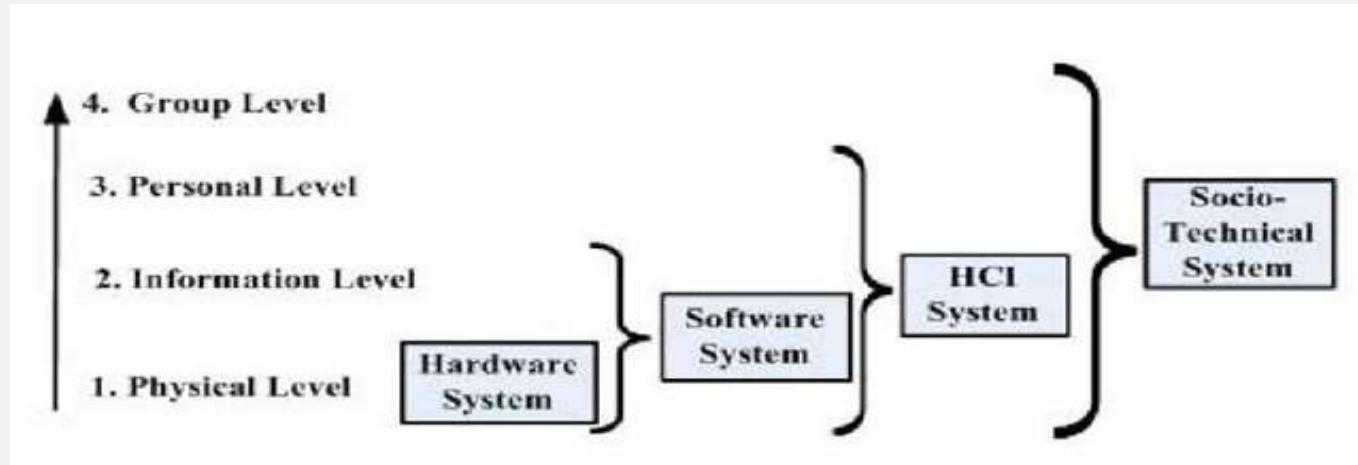
# THE HCI LINEAGE



1. Computer Science, Information Technology, Information Science, Software Engineering
2. Human Computer Interaction
3. Socio-technical System

# TERMINOLOGY

1. **Technology**: A physical **device** people use—e.g., a shovel
2. **Information technology (IT)**: Technology that creates **information**—e.g., a cell phone
3. **HCI**: IT that creates **meaning**—e.g., person using a cell phone
4. **Socio-technical**: HCI system that supports a **community**—e.g., social network



# NEW WAYS TO FAIL

Levels of exchange...

- **Hardware system:** Energy
- **Software system:** Information
- **HCI systems:** Personal meaning
- **Socio-technical:** Social norms, memes, culture

Higher level systems fail differently...

- **Hardware:** Physical errors
- **Software:** Processing errors
- **HCI:** Understanding errors
- **Sociotechnical:** Social errors

Technology can fail for non-technical reasons.

- HCI systems fail for human reasons: misunderstanding, inattention
- Socio-technical systems fail for social reasons: Injustice, unfairness, mistrust, cheating



People are now part of computing



# NEW COMPUTING REQUIREMENTS

| Level                       | Requirements  | Errors   |
|-----------------------------|---|--|
| <b><i>Community</i></b>     | Improve social productivity, synergy, fairness, freedom, privacy, transparency. | Unfairness, slavery, freedom, selfishness, apathy, corruption, privacy |
| <b><i>Personal</i></b>      | Improve meaning transfer, understanding, ease of use.                           | Misunderstand, distraction, information overload                       |
| <b><i>Informational</i></b> | Improve data processing, storage or transfer rate.                              | Processing hangs, storage overload, data conflicts                     |
| <b><i>Mechanical</i></b>    | Improve heat or force transfer rates.   | Overheating, mechanical failure, jam, blockage                         |

# PART 2. CONTROL

## **Centralize** (Von Neumann)

### **Central Processing Unit:**

- **Advantage: Control** – can save a data state, handle an interrupt, then reload
- **Disadvantage:**  
**Fragile** - if the center fails it all **fails**, so one wrong bit can crash a computer.

## **Decentralize** (Nature)

### **Decentralized brain:**

- **Disadvantage:**  
**Chaotic** – can't save the neuron interaction state and can hang—e.g., neurotic rocking
- **Advantage: Reliable** – a brain democracy is more stable than a computer dictatorship.

## **Can be either**

### **Networks:**

- **Centralized:** Polling, is reliable but slow, OR
- **Decentralized:** CSMA/CD (Ethernet) is 5-10 times faster but can hang.

# HOW WE THINK WE ARE

We think we have a unified self

A central point of control or “I”

That registers the senses like a movie

That this “I” is somehow “in charge”

Yet this **homunculus** argument is recursive! (see later)



*We think we are one thing*

# A BRAIN CPU?

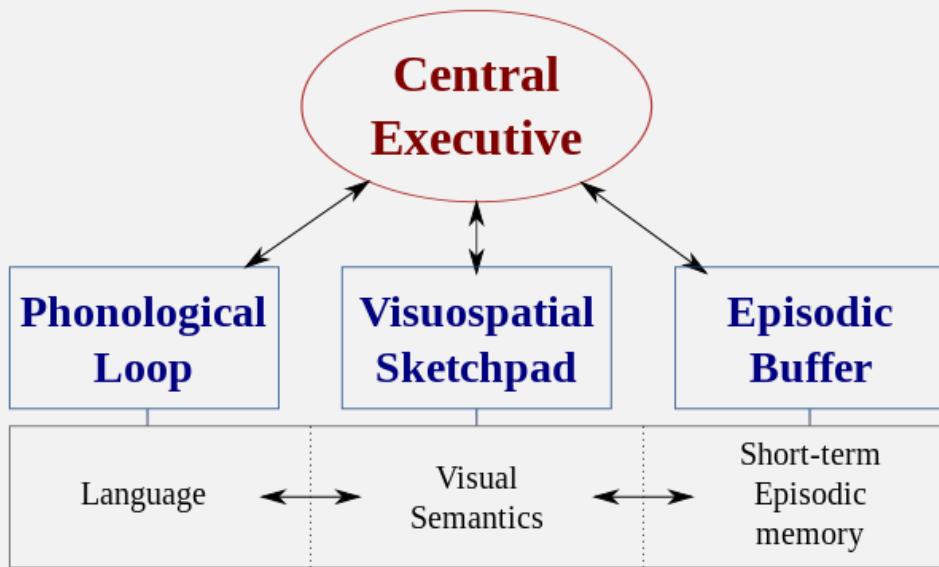
We see ourselves as **one** thing, not many, and so **assume** that sensory input goes to one place – but it doesn't;

And **assume** that all motor output comes from one place – but it doesn't.

Where does that leave “The Self” or “I”?

Does the brain have a CEO, a central executive?

Does the brain have a CPU?



The brain **doesn't** work like this!

# HOW WE ACTUALLY ARE

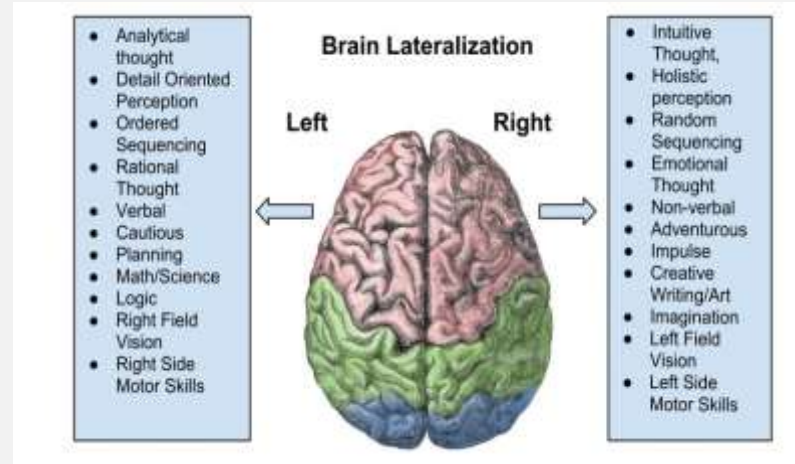
Neuropsychology reveals that the brain has no central CPU, no executive that controls all

The brain is split – at the highest level:

- Left hemisphere controls right side
- Right hemisphere controls left side
- People with a stroke in one hemisphere lose function on the opposite side.

**Specialization:** In most people:

- Left hemisphere specializes in language
- Right hemisphere specializes in space
- They share the work – each is also a backup.



**Brain is duplicated at the highest level (cortical)**

# THE NETWORK BRAIN

The cortex is **duplicated**, and the two hemispheres are **functionally equivalent** (initially at least).

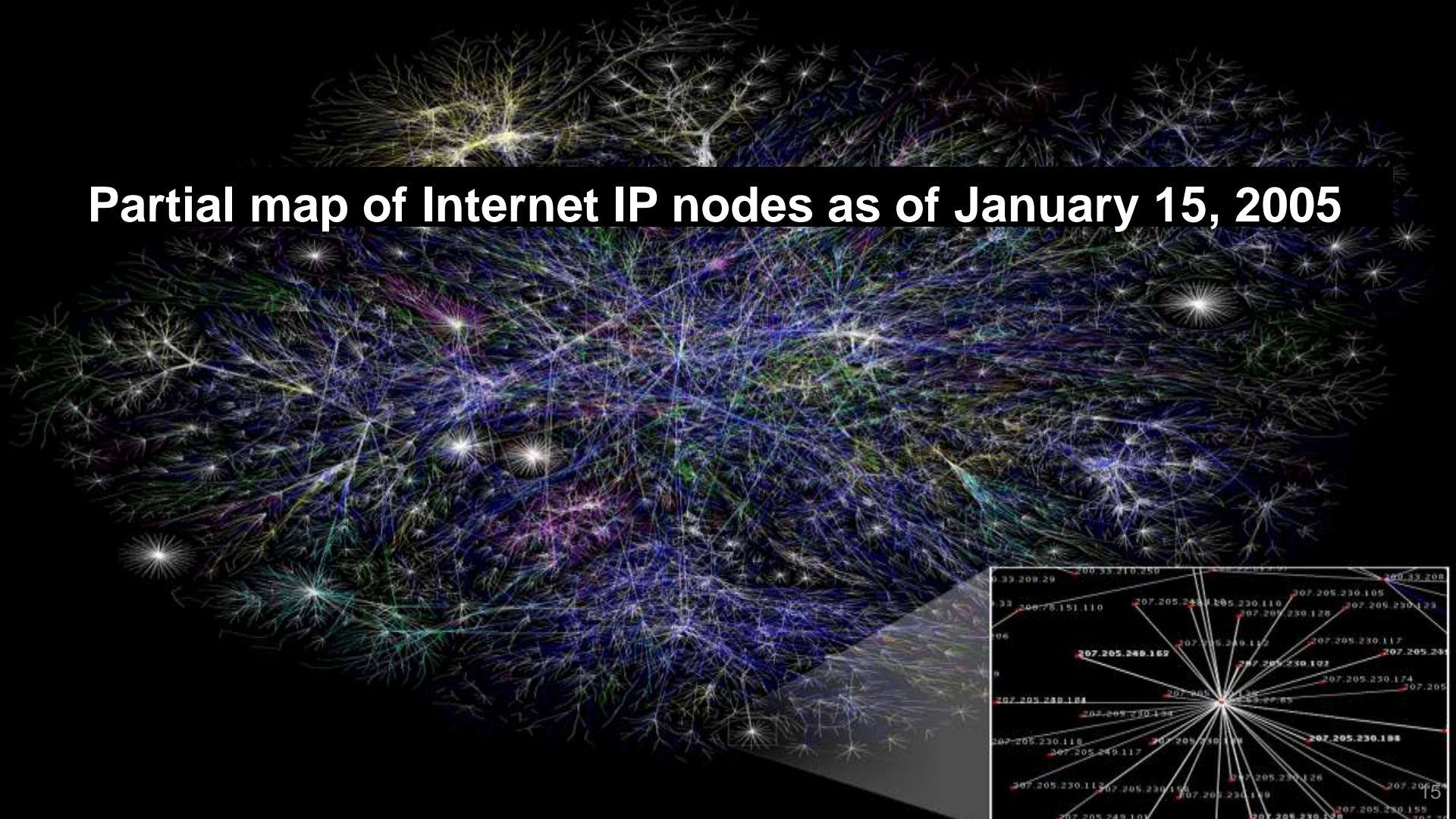
- The cortex is the highest-level brain processing.
- It controls all our higher human functions, such as planning, thought, language, logic, speech...
- *The brain has no central CPU in control.*

Control is **shared**, as in a distributed network like the Internet, which has “no-one in charge”.

**How this control changes is attention.**



# Partial map of Internet IP nodes as of January 15, 2005





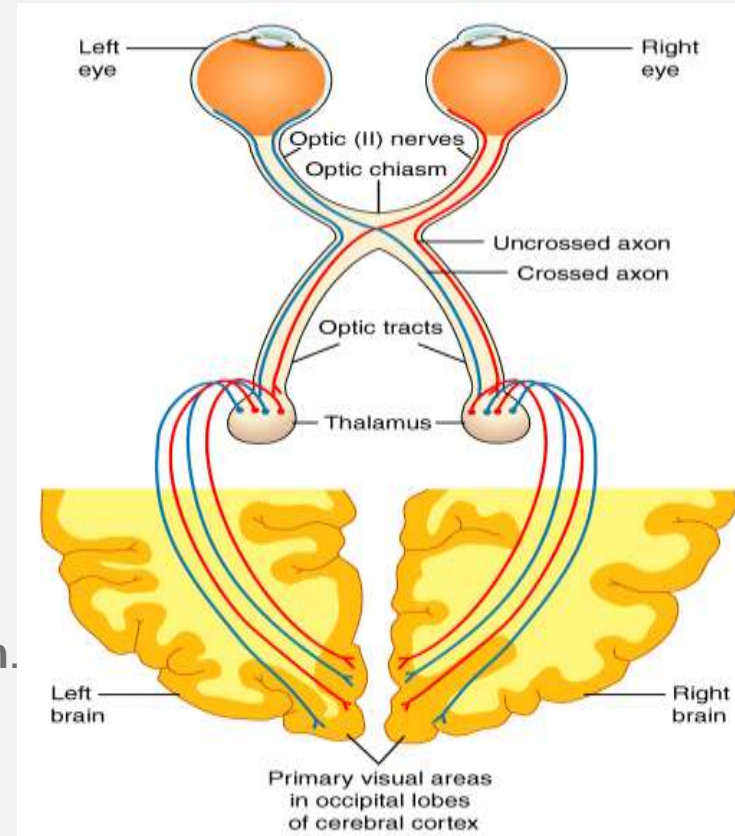
# SHARING THE WORK

Each hemisphere processes the opposite half of the visual field.

- **Left visual field from both eyes** goes to the right hemisphere
- **Right visual field from both eyes** goes to the left hemisphere

The brain divides up the visual field work.

- Each does **half** the work but gets **all** the results.
- The hemispheres share data by the **corpus callosum**.
- Both “see” the entire visual field.
- Each hemisphere processes its half, adds the other hemisphere’s output, and discrepancies give depth.



**The two hemispheres share the work.**



# THE SPLIT BRAIN

**Epileptic seizures spread between hemispheres.**

So surgeons cut the **corpus callosum**:

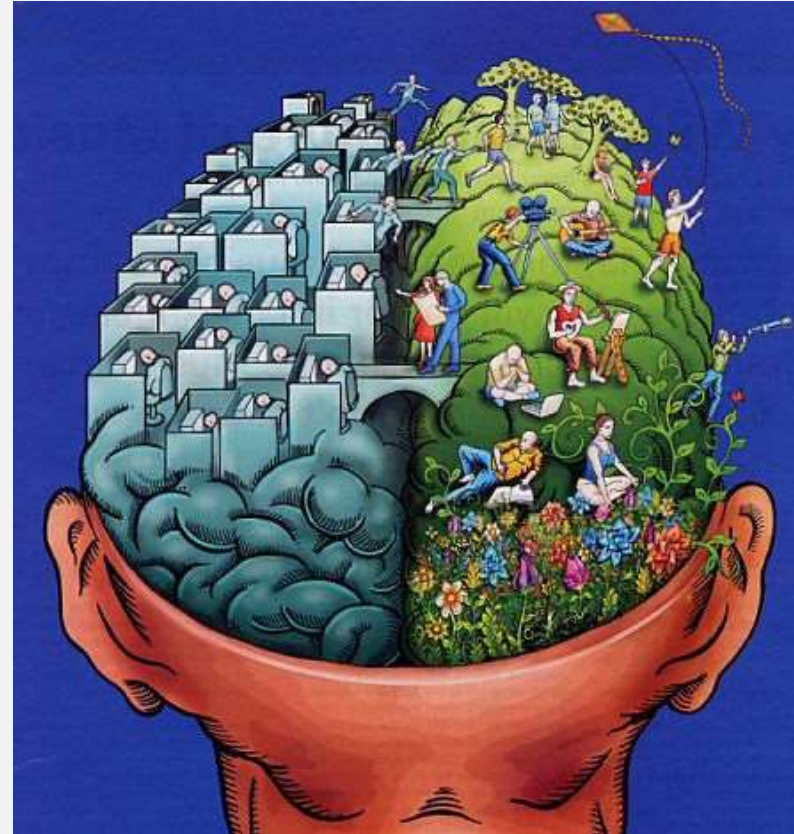
- **800 million nerves** that connect the hemispheres
- Stopped the epilepsy from spreading

The resulting Split Brain patients seemed normal!

- Felt no different, walked and talked the same
- Their sense of self was unchanged.

What did the corpus callosum do?

- Was it just structural?
- The highest systems of the brain were cut apart and everything still worked fine!



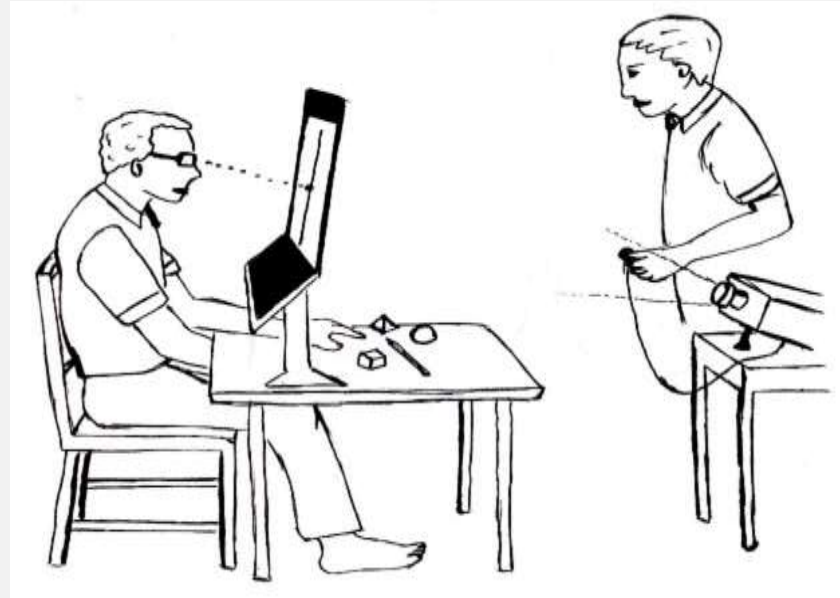
# SPLIT BRAIN EXPERIMENTS

Presented different left/right pictures

- Right-field images went to the LH which controlled the right hand.
- Left-field images went to the RH which controlled the left hand.
- The right hand responded to the right-side images.
- The left hand responded to the left-side images.

Either hemisphere could be “the person” **by itself**.

- How can **two** hemispheres act as **one** person?
- Is there a neurological basis for **I**?



# A DOUBLE “I”

The RH saw snow and pointed to a shovel.  
When the subject was asked why, **the verbal LH** (that saw only a chicken foot) said:  
*“You need a shovel to clean up after chickens.”*

The LH had no idea why the shovel was chosen, so **it just made something up.**

- “It does **not compute**” is not a brain option.
- Each hemisphere maintained the I illusion.



# PART 3. THE “I” ILLUSION

The **ego** is our *idea of ourself* as “I”.

- **Your ego is your idea of yourself.**
- It is a built-up idea that may or may not be accurate, not an actual self.
- It connects to your **name**.
- It is entirely imaginary.

We need an ego to function in society.

- A baby begins with no ego.
- Children build their ego from 3-4 onwards, often based on what others tell them.
- Computers have no ego.



# WHO IS IN CHARGE?

Which hemisphere is **in charge**?

- **Neither** is always dominant.
- **Both** are sometimes in charge.
- For language tasks, the LH takes charge.
- For spatial tasks, the RH acts.
- The highest bidder wins the brain control “auction”.
- “Who is in charge?” is the wrong question.
- “How is control shared?” is a better one.

Hemisphere subsystems are **autonomous**.

- Hearing, vision, motor subsystems ...
- Every **cell** is autonomous.
- As the little old lady said, “*It’s turtles all the way down.*”



The brain is a distributed network.

# A SOCIETY OF MIND

**Neuro-psychology** describes a hierarchical network system that **divides up the work**.

It does not describe a brain with a central control executive corresponding to a unitary “self”.

- See Whitworth, B., 1975, Brain Systems and the Concept of Self, M.A. Thesis, Auckland University, Auckland.
- The brain can be said to consist of *agents* interacting in a society of mind (Minsky, 1986).

Hinduism, Buddhism and Taoism agree that the **ego** is a **mental projection**, not a reality.

*“Give up the notion that 'I am so and so'.” Maharshi*





# SPECIALIZATION

As people specialize in physical cities,  
so neural assemblies specialize in the brain “city”.

**Special service teams** work this way:

- Facing a cliff, the climbing expert takes charge.
- In a water-crossing, the water expert takes charge.
- For tactical decisions, the officer leads, etc.

**Ethernet** networks are more efficient because

- Each node is **free** to seek what they need, and the system works out any conflicts.
- Democracies win by efficiency, not “goodness”.

**Specialization:** Different assemblies specialize

- All body cells come from one cell (the zygote) then *specialize* into skin, heart, etc.
- In nature, the sexes are **biological specialties**.



# WHO AM I?

**Are you saying “I” don’t exist?** No—I’m saying science says you aren’t what you think you are.

**You have two equally logical options:**

- 1. Only the physical world is real:** So
  - There is no real “Self” nor consciousness.
  - We are a **neural machine** with an “I” **illusion**
- 2. Consciousness is real:** “I” exist, and so
  - The “I” sense isn’t based on neurons.
  - The brain is the **organ of the mind**.
  - Consciousness is the **source/sink** of the brain

Millions of Hindus, Buddhists and Taoists believe that consciousness existed before observed things

*"There was never a time when I did not exist, nor you. Nor will there be any future when we cease to be."*

— George Harrison’s favourite **Gita quote**

**Take your pick  
between these two  
options! Either  
could be true**



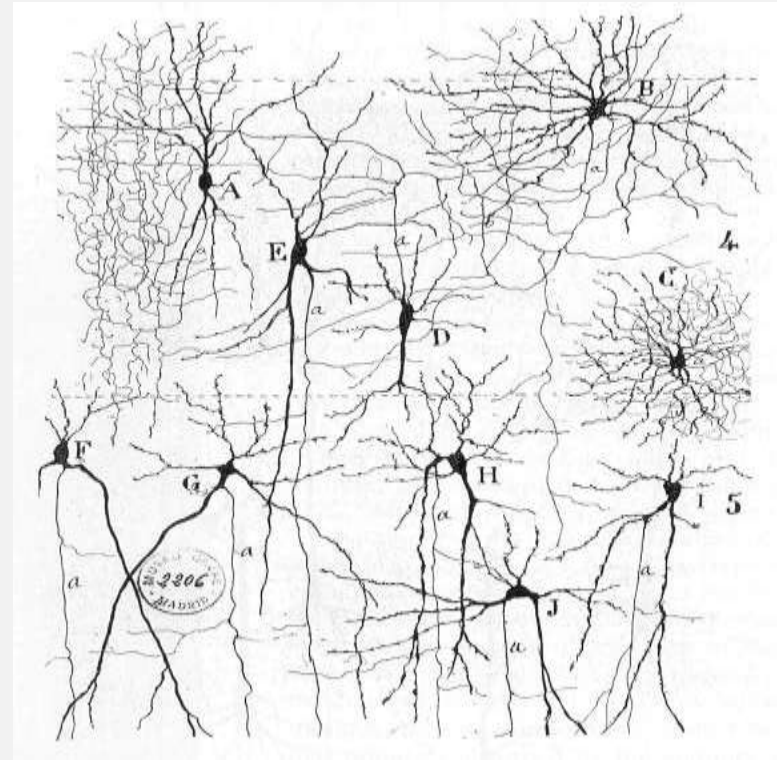
# AUTONOMY

**Autonomous** sub-systems input-process-output **by themselves**, so they

- **Self-direct**
- **Self-evolve**

## Computing autonomy

- Phones that switch themselves off
- Self-maintaining systems:
  - Auto-disk checks, auto-virus checks, auto-updates
- Networks with no-one in charge: The WWW
- Group vote web sites: Slashdot, Twitter



Neurons interact autonomously

# SOCIAL AUTONOMY

We call social autonomy **freedom**.

- **Freedom:** The right of the individual to do what seems best at the time!
- **Autocracy:** One person decides for all.
- **Aristocracy:** The best decide for all.
- **Plutocracy:** The rich decide for all.
- **Meritocracy:** The competent decide.
- **Socialism:** The people decide.
- **Communism:** The people decided.
- **Democracy:** The people decide who decides.

## Aristocracy or Meritocracy?



Citizens for Tax Justice | [www.ctj.org](http://www.ctj.org)

The wealthy will transfer **\$60 Trillion** to their heirs over the next 55 years.

Those heirs will benefit from policies backed by today's well-heeled political donors and pay **less than 10% in taxes** on that wealth.

# BRAIN SUBSYSTEM AUTONOMY

Neural assemblies **compete** to affect what “I” do.

Connections that **work** are reinforced; those that aren’t used fade away.

**Lower** processing affects **higher** processing in the processing hierarchy, and vice versa.

The group outcome is **accepted** by all.

**Conclusion?**

The brain is a **democratic meritocracy**.



The brain invented democracy before the Greeks!

# ATTENTION

**Attention:** How the brain selects processing priorities

**Grab at the bird of attention**, and it flies away.

- **We tune out** flashing banners.
- **Close** pop-up windows without reading them.
- **The louder** TV ads get, the more we ignore them.
- **Forced** people fight back or **leave the field**.
  - Leave TV to browse the Internet

**Offer it a place**, and it sits on your hand.

- People flock to software that gives choices.
  - Amazon and E-Bay offer commenting, voting.
- Managers complain about herding cats.
  - If you want to herd, hire cows.
  - If you hired cats, put out milk.
  - Wanting **creative slaves is a contradiction**.





**Grab at the bird of attention, and it flies away.**



**Offer a place, and it  
sits on your hand.**





# PART 4. INFORMATION OVERLOAD

Our visual “**wetware**” handles 600 Mbits/sec, but the world out there has **MUCH** more information than that!

**Information overload:** When information comes in faster than it can be processed.


- We store it for batch processing later.
- We process information better that way.

**A newborn baby has:**

- Many input channels (senses)
- That vary over a vast amplitude range
- With complex spatio-temporal patterns
- Any one of which can be important.
- Information overload was our first world experience!
  - “*a blooming, buzzing confusion*” – William James



Information overload is normal

A close-up photograph of a newborn baby lying on its back, crying. The baby's face is the central focus, with its eyes squeezed shut, a wrinkled forehead, and an open mouth showing its tongue. The baby has dark hair and is wearing a short-sleeved shirt with thin, horizontal stripes in white and a light beige color. Its hands are raised near its head, with fingers slightly curled. The background is a plain, white, slightly wrinkled fabric, likely a bedsheet. In the upper right corner, there is a semi-transparent white rectangular box containing black text.

**A baby's world is a  
blooming, buzzing  
confusion.**



# A FACT OF LIFE

## Information overload:

- Is a fact of life that we are used to, but like the weather, we don't have to suffer it for a new web site or app
- New technology helps musical learning
  - BACH software presents one chorale line and adds the next when cortex sensors report no information overload.

95% of a screen is initially ignored.

- People have to **learn** what is important.
- Strategies to deal with overload:
  - **Short term:** Strong now, weak later
  - **Long term:** Weak now, strong later





**The Internet is massive  
information overload**

Getting information off the  
Internet is like taking a  
drink from a fire hydrant.

Mitchell Kapor

# SHORT-TERM STRATEGIES

## Short term strategies:

- **Ignore:** Like a horse with blinkers.
- **Panic:** Do more, work harder.
- **Run away:** Leave the field.

## Problems:

- Issues ignored **find you**: Rabbits multiply if left.
- **Doing more of the wrong thing** makes it worse.
- **Problems repeat.**
  - Your **new wife** may hate you for the same reasons as the old.
  - Everywhere you go, you are still you.



# LONG-TERM STRATEGIES

**Long-term strategies** take more time:

- **Discern** – Important or not? Urgent or not?
- **Understand** – Understand underlying causes.
  - **Who is funding** this? Why are you doing this?

**The Result** is improved processing:

- **Allocation:** Discern relevant from irrelevant (attention)
- **Depth:** Improved understanding of abstract causes
  - Essentially better input **encoding**—e.g., trust the **vendor** or the **product**?
  - If a sage gives you vinegar, drink it; If a fool gives you honey, throw it on the ground.

|               | Urgent  | Not Urgent                               |
|---------------|---|--|
| Important     | Crying baby<br>Kitchen fire<br>Some calls<br>1    | Exercise<br>Vocation<br>Planning<br>2    |
| Not Important | 3<br>Interruptions<br>Distractions<br>Other calls | 4<br>Trivia<br>Busy work<br>Time wasters |
|               | Importance vs. Urgency                            |  |

# SHORT-TERM DESIGN

- **Distract:** Look at this! Buy now!
- **Confuse:** Cheap prices (costly pack/delivery)
- **Mislead:** Limited number! Limited time!
- **Hide:** Bank charges. Printer cartridge costs
- **Fool:** Online degrees, Trump University
- **Pretend:** That a shoddy product is good

Technology helps faking and helps the truth come

- Over **people**
  - By community feedback
- Over **time**
  - We Google “Problems with xxx”
- The **culture** also learns.

YOU MAY FOOL ALL THE  
PEOPLE SOME OF THE TIME;  
YOU CAN EVEN FOOL SOME  
OF THE PEOPLE ALL THE TIME;  
BUT YOU CANT FOOL ALL OF  
THE PEOPLE ALL THE TIME.

**ABRAHAM LINCOLN**

**WHO WAS ABRAHAM LINCOLN.COM**

# LONG-TERM DESIGN

- **Prioritize** the content you present.
  - Put first things first – top or left.
- **Simplify** early screens.
  - Remove everything unnecessary at first.
  - Use **Just in Time** techniques.
    - Mouse-over hovers, local windows
- **Direct attention.**
  - Focus initial attention on the important.
  - Don't hide important things in tiny places.
    - PowerPoint **Slideshow** button hard to find
    - Mode on/off buttons should be obvious.
  - What do people want to read/do first?
    - [Protocol analysis](#) – think aloud method





# DRIVING

**Driving:** A classic information overload problem

- Reduces as drivers **discern** situations and **understand** accident causes
- The main cause of accidents is not speed but **inattention**.

**Experienced drivers:**

- Recognize the **key features** of accidents
- Understand **situation possibilities**

When a dangerous situation arises:

- Experienced drivers see early what novices don't **see it** until it is too late!
- All the warning signs just confuse.



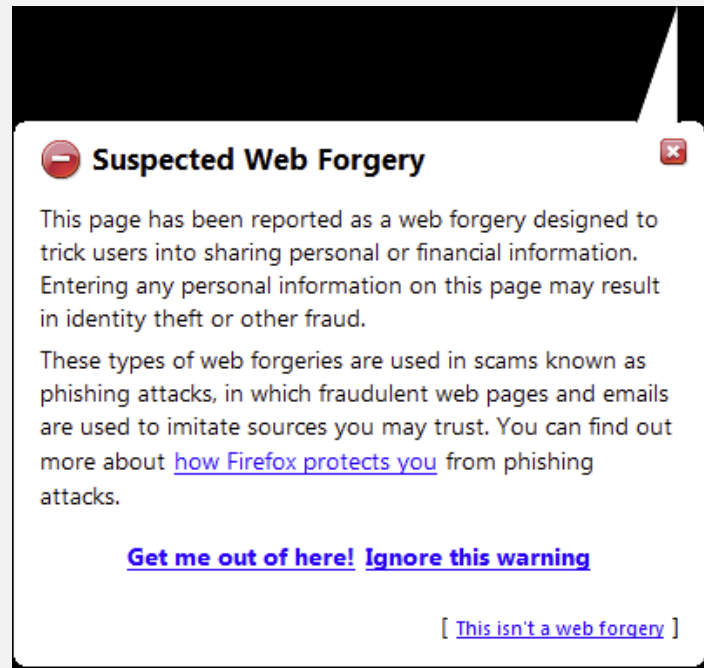
# DRIVING THE INTERNET

Driving the Internet is like driving on the road except that the WWW has:

- No **road code**,
  - See **An Online Bill of Rights**
- No **police**: Get vigilante justice—e.g., anonymous
- Few **warning signs**: Have to know where to look

Online situations can lead to physical danger

- Online **grooming** by predators
- **Attention**: Ignore anything doubtful
- **Understanding**: Who is this request from?
  - **Phishing**: Don't use their link – use your own.
  - Please help me! I need you! This is free!



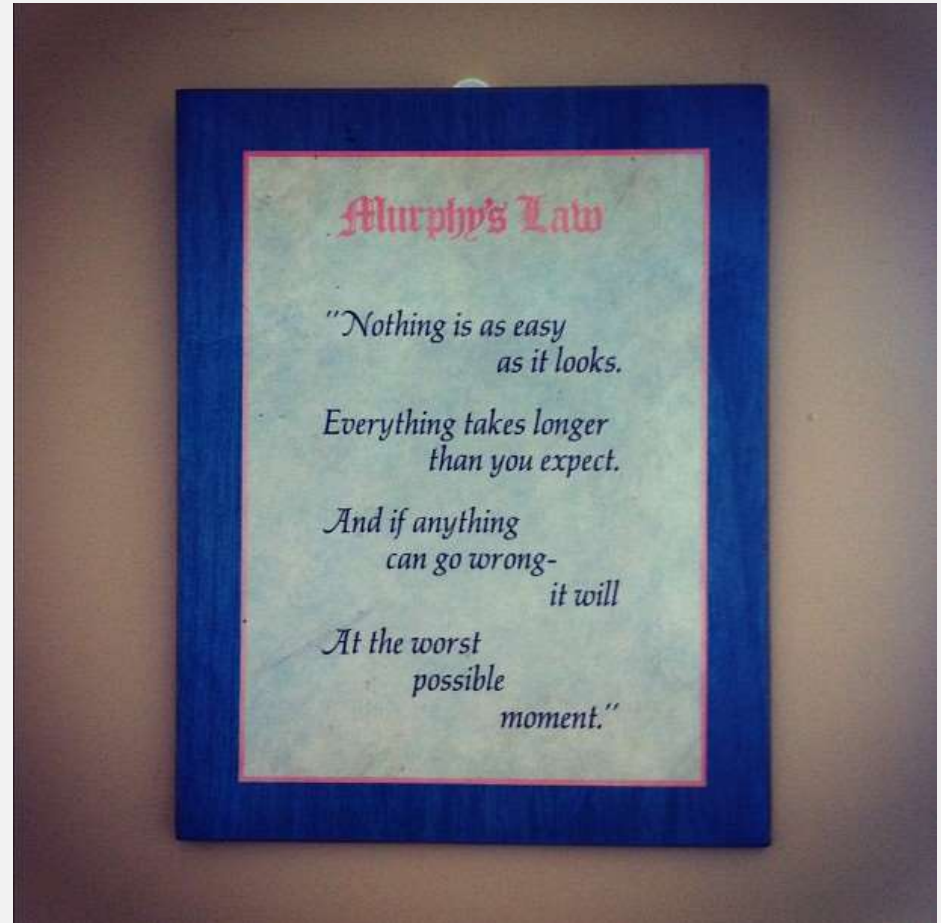
Don't click on this!



# PART 5. SIMPLICITY

The brain tries to reduce complexity to simplicity, but in this world **entropy (disorder) rules.**

- **Murphy's law:** Anything that can go wrong, will go wrong.
- **Paranoia:** When little signals have big effects



# CHUNKING

**Chunking** is making **many things one** by spacing, color, border, style, size, etc.

- Improves memory enormously
- Reduces information overload
- **Framing** defines a chunk.

Miller's magical number 7

- People only reliably remember 4-7 items at once:
  - Less than seven screen areas
  - Less than seven menu choices
  - **Chunk** lists with more than 7 items.

|   |                |    |               |     |  |   |
|---|----------------|----|---------------|-----|--|---|
| Fayne   | Statistics     |    |               |     | Personal Talents   |   |
|  | Strength       | 67 | Speed         | 5   |  Blacksmith | 1 |
|   | Dexterity      | 54 | Charisma      | 12  |  Tailor     | 4 |
|   | Agility        | 58 | Luck          | 10  |  |   |
|   | Intellect      | 36 | Movement      | 4   |  |   |
| Reaper  | Skills         |    |               |     |  |   |
| Vitality  | Weapon Finesse |    |               |     |  |   |
| Stamina   | Slash          | 50 | Lock Picking  | 5   |  |   |
| [Normal]  | Pierce         | 55 | Haggling      | 20  |  |   |
|   | Bludgeon       | 25 | Awareness     | 35  |  |   |
|   | Bow            | 35 | Concentration | 25  |  |   |
|   | Casting        | 15 | Perform       | N/A |  |   |
| Status  |                |    | Block         | 15  |  |   |
| Inventory   |                |    | Reflexiveness | 15  |  |   |
| Abilities   |                |    |               |     |  |   |
| Titles  |                |    |               |     |  |   |

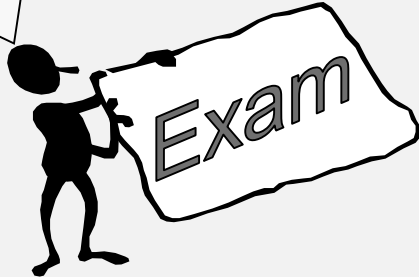
# BAD CHUNKING

Computers are accurate.

Computers are fast.

Computers are powerful.

What are the advantages of computers?

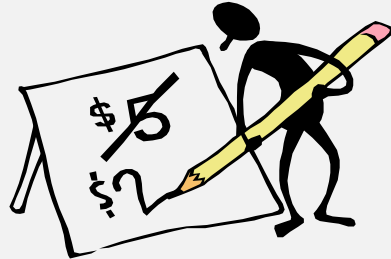
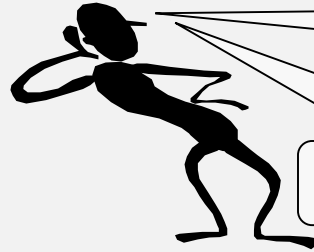


Computers are good.

Computers are good.

Computers are good.

Computers are good.



0 marks

Chunking can be  
**Effective:** Important information is not lost.  
**Ineffective:** Important information is lost.

# ATTENTION REDUCES OVERLOAD

Attention can **reduce** information overload.

- **Select** 2-5% of information for higher processing.
  - Background process the rest (Lesson 2. Intuition).
- **Processing hierarchies** choose.
  - We **focus** on one sound among many, one object among many, one pain among many...
- **Sharing control** can be:
  - **Top-down**: Conscious choices
  - **Bottom-up**: Intuitive distractions
- **Problems** include:
  - **False expectations**: An attention choice error
  - **False intuitions**: A biology heuristic error



We focus on one thing among many

# STRUCTURED OVERLOAD

Obvious information overload is mitigated by:

- Picture plus text
  - Recognize
  - Read
- Black borders
  - Frame areas (Lesson4)
- Menu as expected (Lesson3)
  - On the left
- Search function
- White background
  - Relaxes (Lesson2)
- Lots of click choices
  - Links are clear
  - Browse now (Lesson3)



Pictures and frames reduce information overload



# EXCITING OVERLOAD

Shoppers either :

- **Know** what they want
- Don't know and **browse**

Browsers want **variety**:

- Supermarket shopping

Want people **just to click**:

- Lots of click requests
- **Face** makes each click **personal**
- White background for title text
- Tabbing good but text too weak
- Psychedelic mood background implies “crazy” bargains
- Sensitive people just leave
- No doubt what the site is about



Intentional information overload?

# RANDOM OVERLOAD

People visit museums for information, not thrills.

- Too much in the header.
  - Where to look first?

So as **just to click**:

- Make **contact** details a click.
- **Map graphic** adds little value.
- Non standard main menu
- Cool James Bond graphics lost.
- Ignores user purpose (Lesson6)
  - Why go there?
  - Facilities?
- Graphic lacks action.
- No obvious **structure** (Lesson5) based on **chunking**, so attention jumps about.

The screenshot shows the website for the James Bond 007 Museum Sweden Nybro. The header is cluttered with various logos and text, including "Gunnar Schäfer name is James Bond" and "Visitors in James Bond Museum Sweden". The main navigation bar lists various items for sale or experience: "JAMES BOND THEME PARTY", "DVD/VHS Omega", "BMW Swatch Bic Bollinger Corgi Posters", "Specials James Bond store Cd Game PPKGuns Member Guest". A contact section provides an email address and phone number. A map graphic is present, but it is a simple floor plan without descriptive text. Below the website screenshot is a photograph of the museum's entrance, featuring three cars (a dark grey Aston Martin, a red Lotus Evija, and a blue BMW) parked in front of the building. The building has a sign that reads "007 MUSEUM".

**JAMES BOND MUSEUM**  
WWW.007MUSEUM.COM SWEDEN NYBRO 0481-12960

Contact: 007museum@telia.com Phone +004648112960  
JAMES BOND THEME PARTY DVD/VHS Omega BMW Swatch Bic Bollinger Corgi Posters Specials James Bond store Cd Game PPKGuns Member Guest

Welcome to The [James Bond 007 Museum Sweden Nybro](#) open mon-fri 10-17, sat 10-14

**NYBRO SWEDEN**  
0481-12960  
**JAMES BOND 007 MUSEUM**  
NYBRO SWEDEN  
WWW.007MUSEUM.COM



# SELLING IS OK

People don't mind obvious sell if it is **honest** sell.

- Heading tells what it's about.
  - Put tub picture on left
  - Your business on right
- Excited picture taps emotions.
- You have to **read** main menu to know what it is!
- Far too much text is beside it.
- People want to know:
  - Benefits?
  - Costs?
  - Warranty?
  - Safety?
  - Options? ...
- Unclear structure, weak framing

**Bath Magic Inc.**  
Reglazing Solutions

**Got an Ugly Tub?**  
Don't replace it...Reglaze It !!



[WHO WE ARE](#) / [WHAT WE DO](#) / [WHY US](#) / [HOW WE DO IT](#) / [OUR FINISHES](#) / [COLORS](#) / [SERVICE AREAS](#) / [QUESTIONS?](#)  
[CONTACT US](#)

[CARE INSTRUCTIONS](#) / [4 HOUR CURE](#) / [ANTI-SLIP](#) / [DRAIN KITS](#) / [BATHMATS](#) / [TOUCHUP KITS](#) / [LINKS](#)

**Ugly Tub ?**



Founded in 1993, Bath Magic is in the business of reglazing bathroom and kitchen fixtures. We can make that old tub, tile, or sink look great again at a fraction of the cost of replacement.

**Our finish** is strong, durable, and easy to care for. No more scrubbing with harsh cleaners. Most jobs take just a few hours to complete. Appointments set Monday- Saturday.

We offer Reglazing, Refinishing, and Resurfacing solutions! We can make those old worn out bathtub, sink, or tile look great again at a fraction of the cost of new. Servicing the Cincinnati, Columbus, Dayton and Toledo Ohio areas, along with Detroit, Michigan, Indianapolis, Indiana, Louisville, Kentucky, Rockford, Illinois, and Madison, Wisconsin.

**Specials by City**

CINCINNATI, OH  
COLUMBUS, OH  
DAYTON, OH  
DETROIT, MI  
INDIANAPOLIS, IN  
LOUISVILLE, KY  
MADISON, WI  
ROCKFORD, IL  
TOLEDO, OH

**Bathtub Refinishing VS Bathtub Liners**



**Ask about our 4 Hour Cure Coating !**



**Our Coatings**

**Ugly Drain?**



**Drain Refacing**

**No Slipups !**



**Bath Safety**



**Locations**

**Please**



Only do business with a merchant you can

# PART 6. ENGAGE THE BRAIN

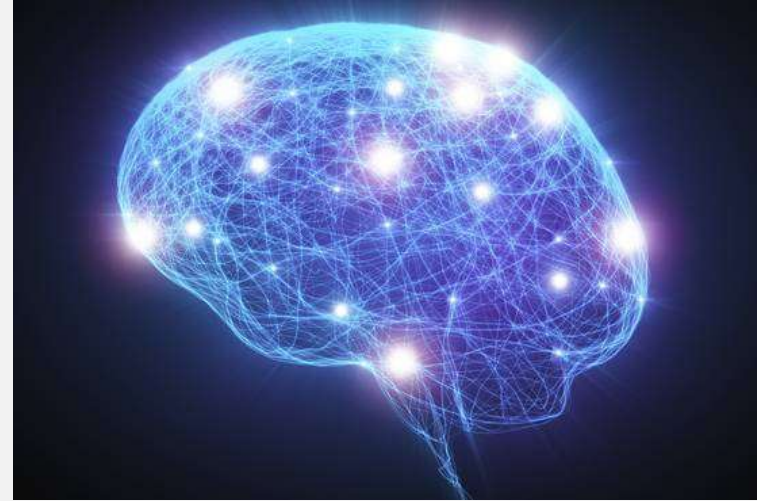
A **full brain** experience lights up the brain more.

**Perceptions** come after sense level analysis.

- **Spatial analyzers** create a sense of 3D space from vision, sound and touch data.

Brain analyzers are **processing factories** for:

- Color, brightness, shading, depth, orientation, movement, texture, familiarity, faces, sound, rhythm, meaning ....
- One would rather do something than nothing.
- Evoking always on processes isn't more work.
- Adding a background doesn't increase information overload, because the background is being analyzed, anyway.



Engage the brain!

# BRAIN RICHNESS

**Sensory-rich computing** (multi-media) engages many senses.

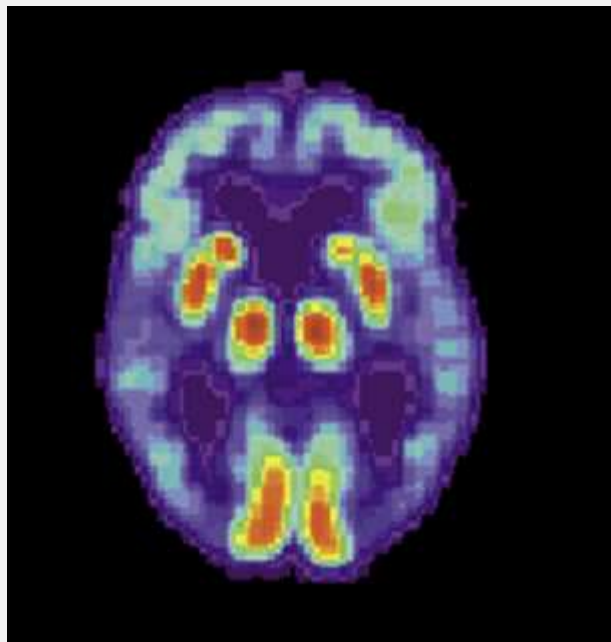
- Video and sound give a fuller **sensory** experience.

**Brain rich computing** engages many brain processes to give a fuller **human** experience..

Examples:

- **Space:** A 3D view
- **Movement:** A path over time
- **Texture:** A surface feel—e.g., rough or smooth
- **Symbols:** A graphic that evokes a meaning
- **Objects:** Recognize things
- **People:** Involve relationships
- **Language:** Text that evokes a meaning

All add to the user experience (UX)



Sites/Apps can light up the brain.

# BOREDOM

**Boredom:** Information underload?

- A “bored” brain needs something to do!
- A brain without input creates it!
  - Isolation experiment subjects hallucinate.

## Individual differences

- **Introvert:** low boredom when alone
- **Extrovert:** high boredom when alone
- One person’s **variety** is another’s **stress**.

**To avoid boredom**, change things!

- **Update** site, and **change** pictures regularly.
- Even the same movie is ignored—e.g., game intros.
- **Communicate** changes to people: “Someone commented on your post.”
- Boredom causes inattention, and inattention causes accidents.



# HABITUATION

**Habituation:** Constant signal effect decays over time.

- **For a steady signal**, nerve firing decays with time.
  - It is not due to information overload.
  - We tune out TV ads that repeat.

**Dishabituation:** The response recovers if the signal stops or changes.

- The more you yell, the less I listen.
- Stop yelling, and I might hear you.
- Every teacher knows – yelling is not the answer.



I can't hear you!

# CHANGE

A new smell over time (repeated stimulus) fades.

- We don't smell our own group.
- Vegetarians at first smell meat on Westerners, then over time it fades.
- A new boarder woke at 2 a.m., shouting, “**What was that?**” as the midnight express train rushed past. Soon, he slept through it. One night, the train broke down, and at 2 a.m. he awoke, saying, “What was that?”

The brain responds to **change**, not stimuli.

- Content updates, comments, movement, sound
- The Google prompt changes.





# THE ADVERTISING BOMBARDMENT

When everyone yells, no-one listens.

- As TV ads get louder and longer, the young move to content that doesn't **push**.
  - Netflix, YouTube, etc.
  - Who under 30 watches TV?
  - People are **cutting the cord**.
- TV today is a dead man walking, because hardly anyone young watches it.

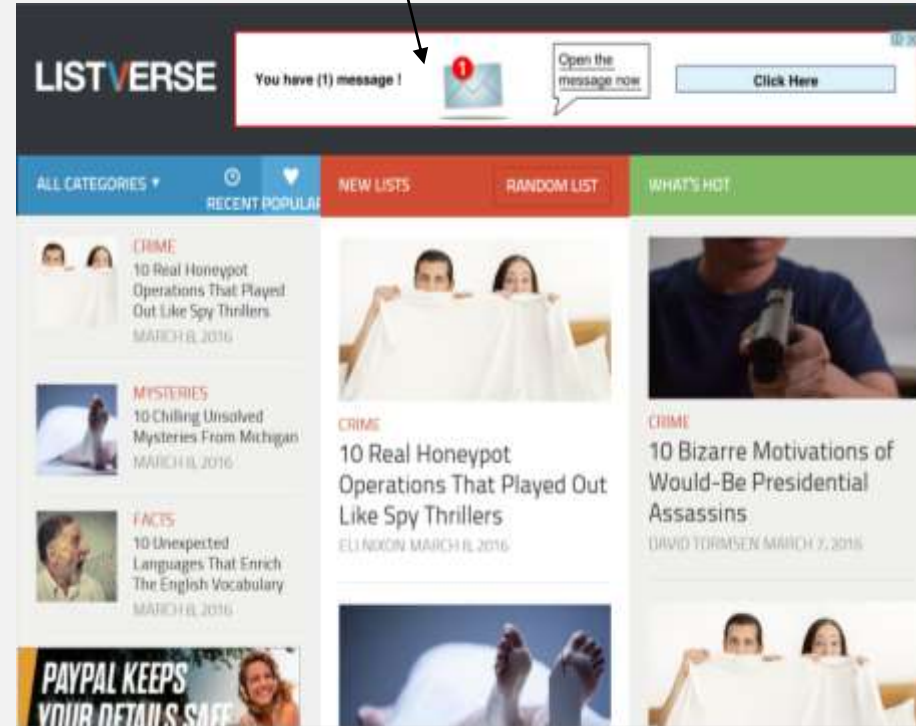


# GOING AD-FREE

The people who made TV unwatchable for many young people are now doing the same to the Internet.

- Internet ads that flash make reading hard
- Ads that target your profile
- YouTube video preview ads
- The dream? **Smart** billboards that call us by name or text ads as we pass
- Make money by selling your hits
- All based on **the myth that ads are necessary** for society

Annoying ad



# TIME FOR A CHANGE

Time for a change

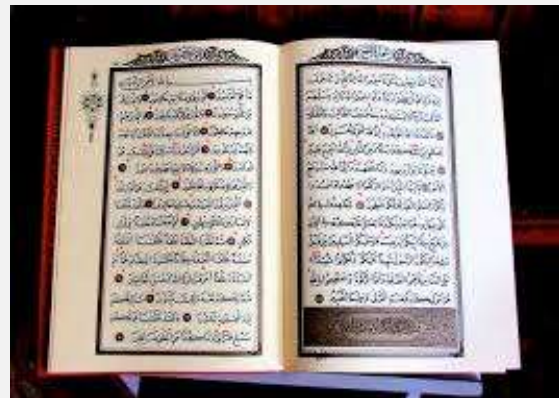
- **Stealing information** from Internet citizens is no different from stealing their physical goods.
- **Eavesdropping** on Internet citizens talking is no different from eavesdropping on physical citizens talking.
- **Private groups:** If public spaces have no privacy, people will opt for private groups with known people—e.g., Society for the Deaf.



# PART 7. ATTENTION FLOWS

Attention **flows** like a stream but with **cultural differences**:

- **English**: From left to right, top to bottom, then front to back
- **Chinese**: Top to bottom, then left to right, then front to back
- **Arabic**: Right to left, then top to bottom then back to front



By **default**, Western attention starts at the top left, so:

- Put your attention-grabbing photo at the left.
- Put menus at left or top, not bottom, right or middle.
- Don't put error messages at the bottom right.
- Put **their stuff** (menus) at the top or left.
- Put **your stuff** (ads, etc.) at the bottom or right.



*Attention flows*

# YES WE SCAN

The visual field isn't processed in one go.

We **scan** pictures about 4 times each second.

- Even staring at a point, **saccadic movement** occurs.
- We scan new images for **key features**.
- Each “icon” result is like a complete photo.
- But like a buffer, new data wipes out old.
  - People with eidetic memory can move the buffer to long-term memory.

Text is also scanned from word to word, then restart the next line.

- A **word** is a set of letters and a **shape**.
- **Left-aligned text** minimizes scanning.
- Only use centered text for headings or quotes.



# ATTENTION CUES

Attention evolved to handle **danger** and **opportunity**.

- **Sudden movements** grab attention but **scare**: e.g., pop-ups.
- **CHANGES** merit investigation and **concern**: e.g., police lights.
  - More change gets more attention—e.g., the police car evolved from a simple siren and flashing red light to:
    - Sirens with many tones
    - Lights with many colors
    - Moving flashing lights
- **Emotional** things get attention—e.g., a word that upsets.
- **Unusual** things get attention—e.g., a face with no nose.

Attention is a **limited resource** – don't waste it.

- Police with their sirens *always on* are ignored.





# SOCIAL ATTENTION

**Social looking** is an **act**.

- It can be aggressive—e.g., gorillas, dogs.
- The internet lets us **look for free**, as **online voyeurs**.
- A web site is like visiting someone else's kitchen.

**Public attention** is social **following**.

- **Celebrities** crave attention, then complain about it.
- **The autograph** is now the **selfie**.
- **Microblogs** such as **Twitter** make following easier.



**We all like social attention**

# INFORMATION POWER

**Information power** is now fought over as physical power was in the 20th century.

- As always, war hurts everyone; peace helps everyone.
  - New USB Type C standard stops proprietary wars.
- Attention is now a **commodity**.
  - Sell clicks and views to Google.
- Will your web site sell its customers' information?
- A social invention of the 20th century was **propaganda**, the mass **one-way** exchange of ideas.
  - Propaganda by Radio, TV and Film killed more people last century than the machine gun—e.g., Hitler's racism.
  - The information wars continue today on the Internet.
  - Anyone who retweets, links or posts is a combatant!



**No need to buy a different  
adapter to charge every  
different device**

# BELONGING

**Belonging:** People who **belong** to a **community** see themselves as **part** of it.

- **Social identity:** Our social identity, like our personal identity, is a mental creation.
- **Defence:** To attack my community is to attack me, so I will die for it.
- **Alienation:** **Not to belong** anywhere!
  - One can't **belong** to a community that **abuses** you.
- **Social networks** support our **social existence**.
  - People exist socially as well as physically.
- **Twitter limit:** No more than 300 million people in the world today can agree on anything, so **global** social systems such as Twitter have a top member limit.



**I am a child of the  
universe.**

# PART 8. DESIGNER NOTES: ATTENTION

## Simplify

- 90% of the screen is ignored, anyway.
- **Meaning** amount isn't the **information** amount.

## Focus

- **Use white space, accentuate** the important—e.g., by color.

## Invite

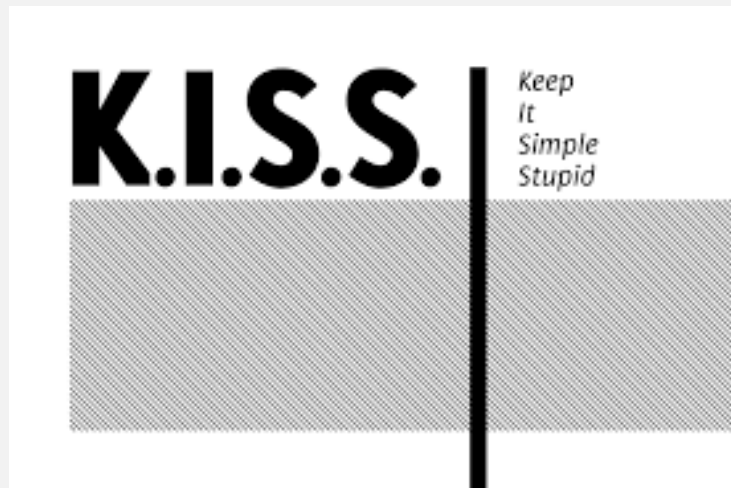
- To **scroll, click or tab** needs a reason. Use **obvious click**.

**Chunk:** *Consistent* structure—group by frames.

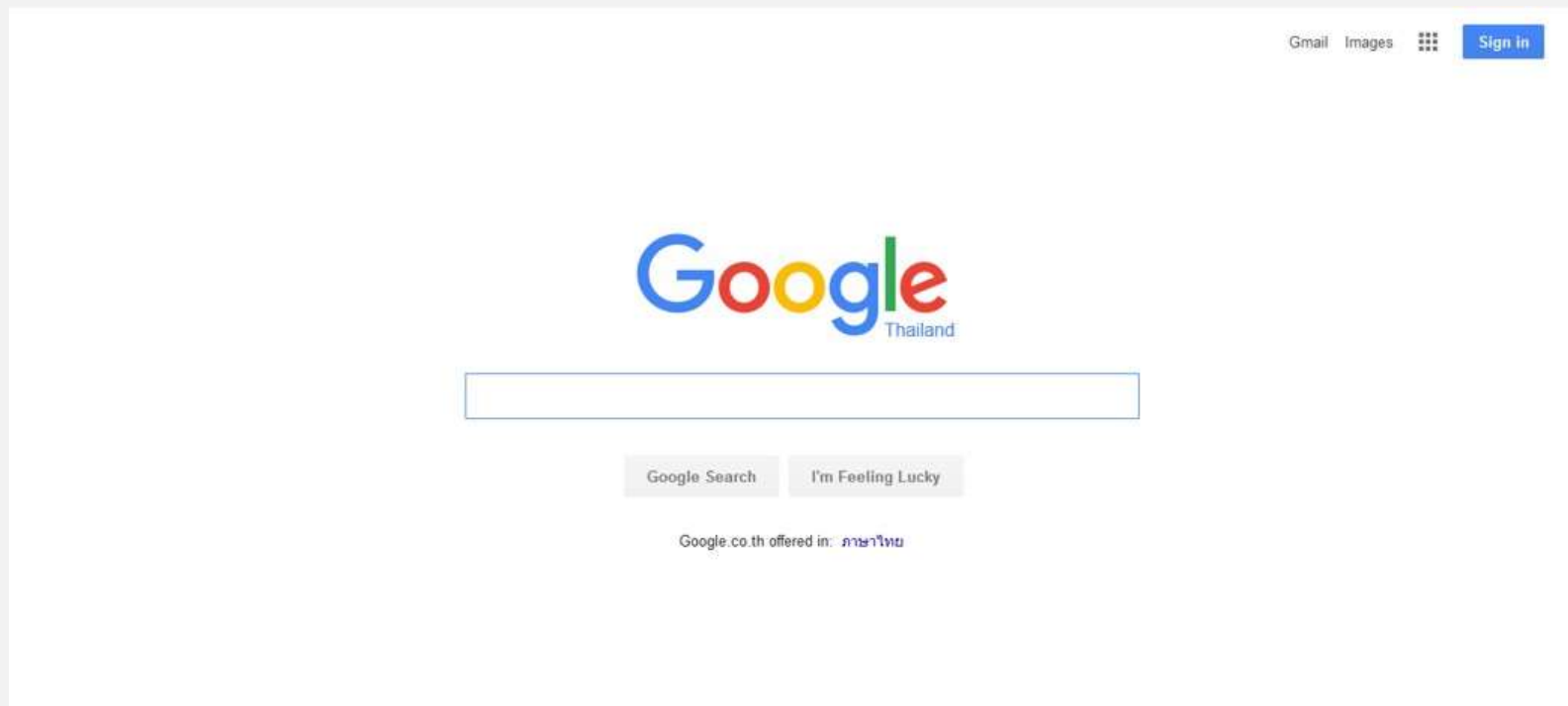
**Prioritize:** Use on demand or just-in-time.

**Engage the brain:** Activate the brain.

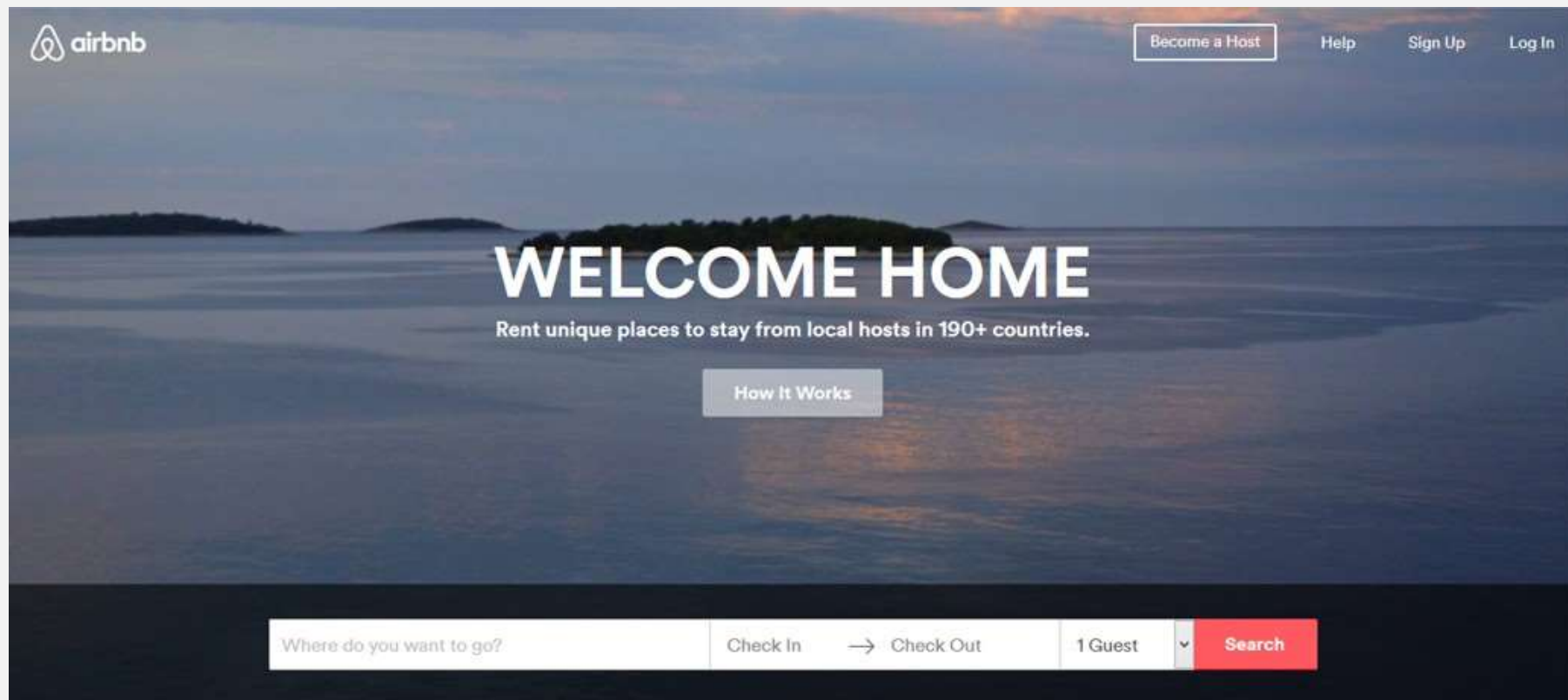
**Don't nag, pester, push or pursue:** If a web site nags me, I just leave - The **push** internet is dying.



# SIMPLIFY

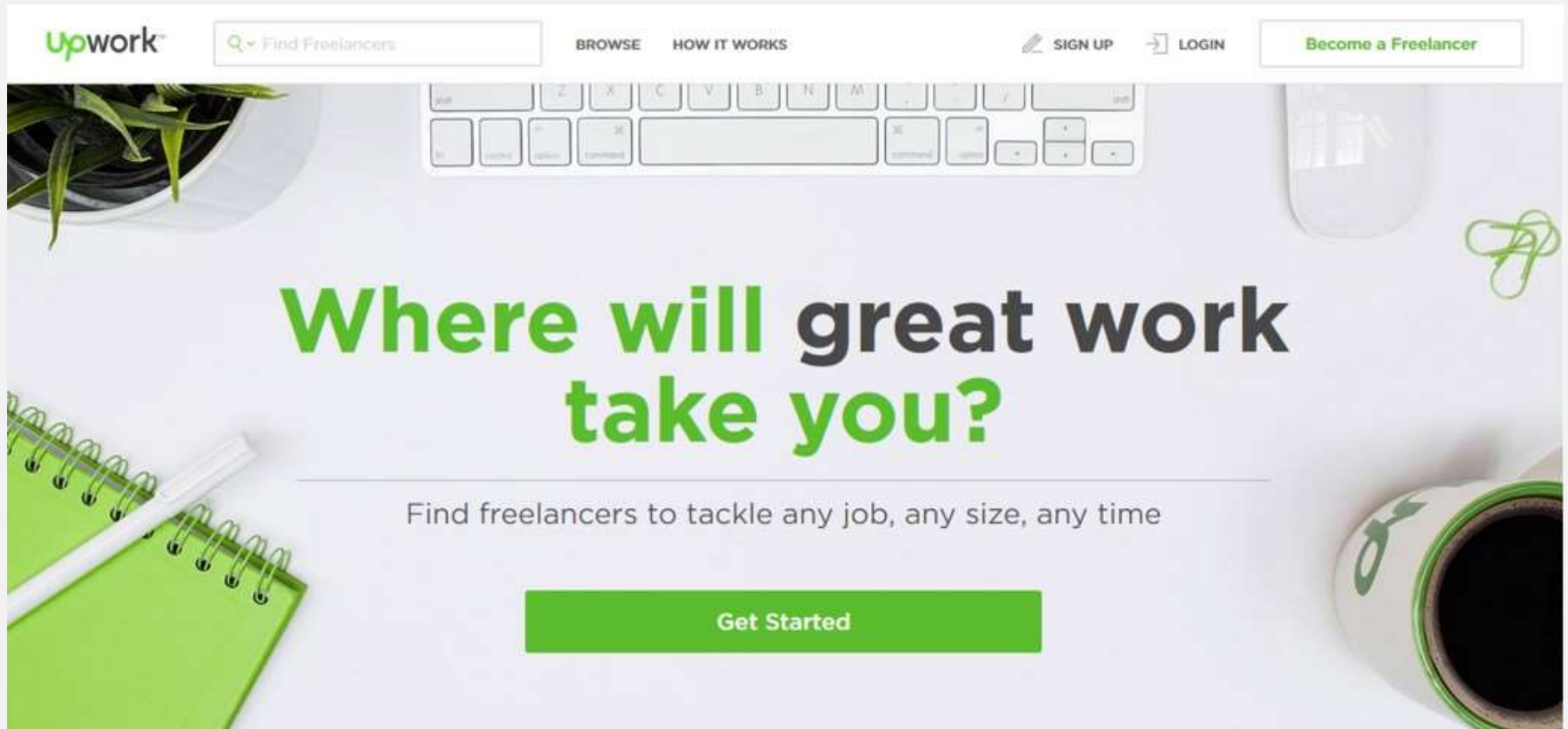


# FOCUS





# INVITE

The banner features a top navigation bar with the Upwork logo, a search bar for finding freelancers, and links for browsing, signing up, logging in, and becoming a freelancer. The main visual is a top-down view of a workspace with a keyboard, mouse, notebook, and coffee. The central text asks 'Where will great work take you?' and includes a 'Get Started' button.

upwork™

Find Freelancers

BROWSE HOW IT WORKS

SIGN UP LOGIN

Become a Freelancer

## Where will great work take you?

Find freelancers to tackle any job, any size, any time

Get Started

# CHUNK

**NETFLIX**

Sign In

See what's next.

Watch anywhere. Cancel at any time.

Join free for a month

SHERLOCK HOLMES  
A SCOTT MOORE PRODUCTION


shameless


LILA & EVE


NETFLIX ORIGINALS  
ORANGE IS THE NEW BLACK


Waiting

Learn more about Netflix below

 So much to watch

 Watch anywhere

 Pick your price

 No commitments  
Cancel online at any time

# PRIORITIZE



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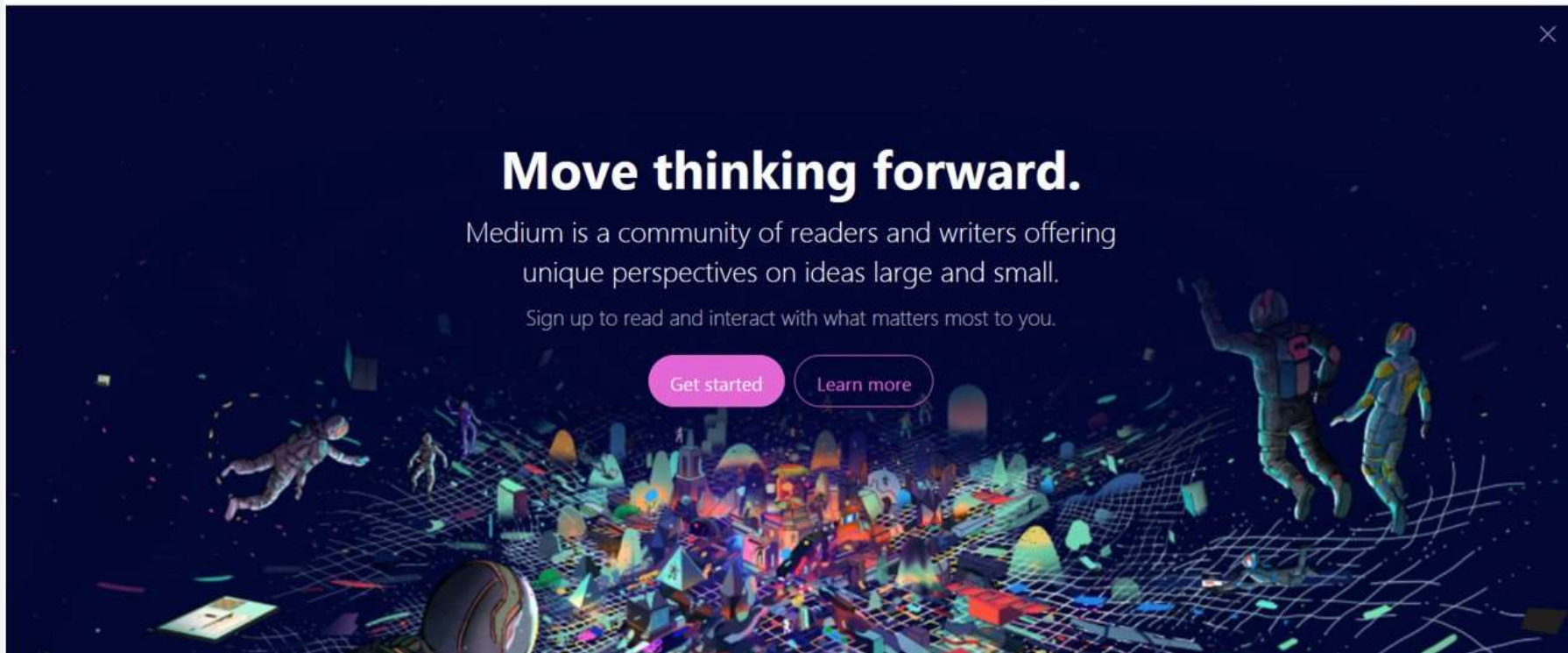
## Move thinking forward.

Medium is a community of readers and writers offering unique perspectives on ideas large and small.

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# ENGAGE THE BRAIN



Play against  
real people.



# DON'T NAG

Thou still unravished bride of quietness

### Paintings by Gregory Thielker

Title: Keats



Search:

Collections:

## Architecture

Generative art

College

### Drawing

### Typography

### Sculpture

## Photography

## Painting

## Planet Earth

# THE LAST WORD

How can designers best reduce information overload?

Present the information **relevant** to a visitor!

Important questions include:

- **Who** visits my site/app?
- What do they want to **do**?
- What do they want to know **first**?
- What information do they want **next**?
- What can be tucked away for **later**?
- How can information be **chunked**?