BIG IDEAS FORUM

The Future of Health

The Future of Health Care

The Future of Medicine

The Future of Health

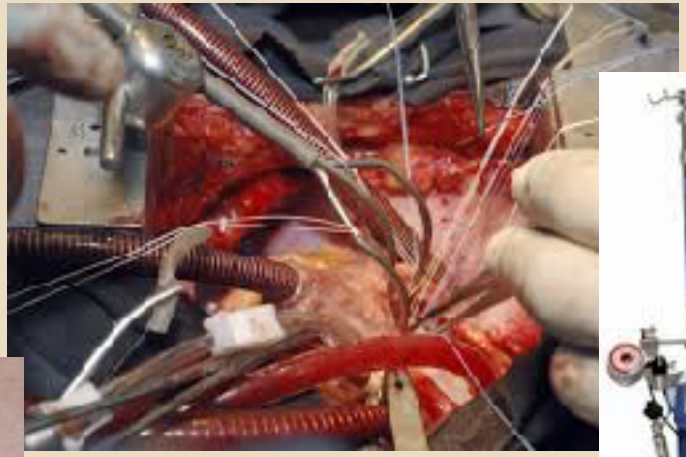
Medical progress, state of the art

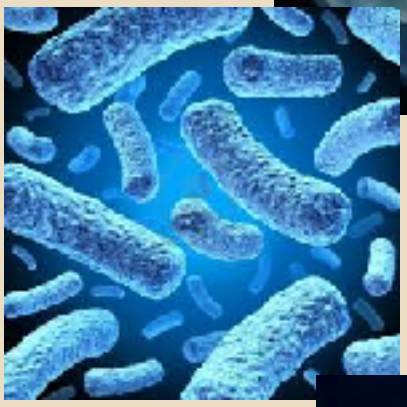
A new paradigm - and “a doctor in your pocket”

Regenerative medicine

Humans v.2.0: Health and the human body by 2025

Medical progress - State of the Art





Medical progress - State of the Art

- Increasingly specialized
- Increasingly sophisticated

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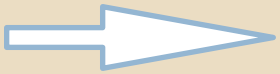
- Increasingly expensive
- Increasing polypharmacy (poly-morbidity)
- Decreasing amount of doctor-patient time
- Decreasing satisfaction



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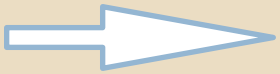

- Conclusion: We need a new paradigm

The Future of Health

- Medical progress, state of the art
- A new paradigm that delivers *better* patient treatment at a *lower* cost
  - MODEL: ***Integrative* Medicine**:
    - holistic rather than symptom-based treatment
    - patient in the center/patient responsible
    - (example)
    - and . . .

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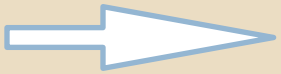
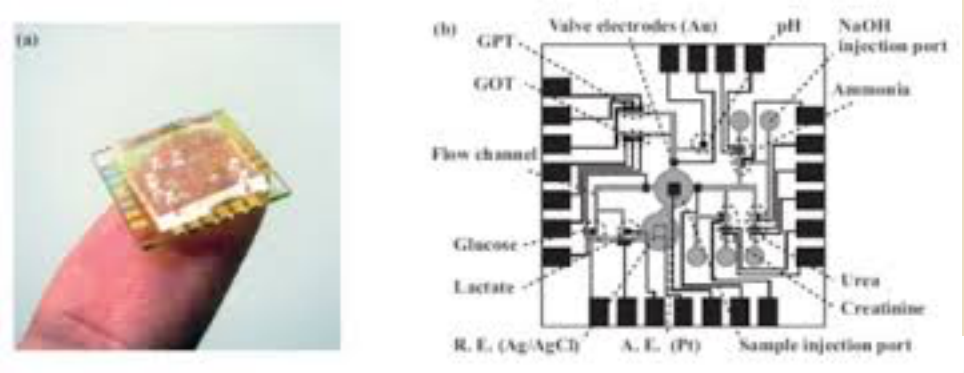
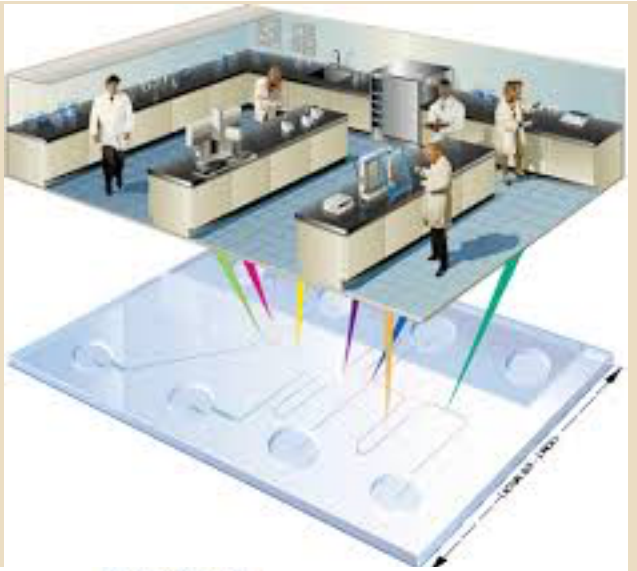
  - MODEL: ***Integrative Medicine***:
    - holistic rather than symptom-based treatment
    - patient in the center/patient responsible
    - **IT technology** at your fingertip



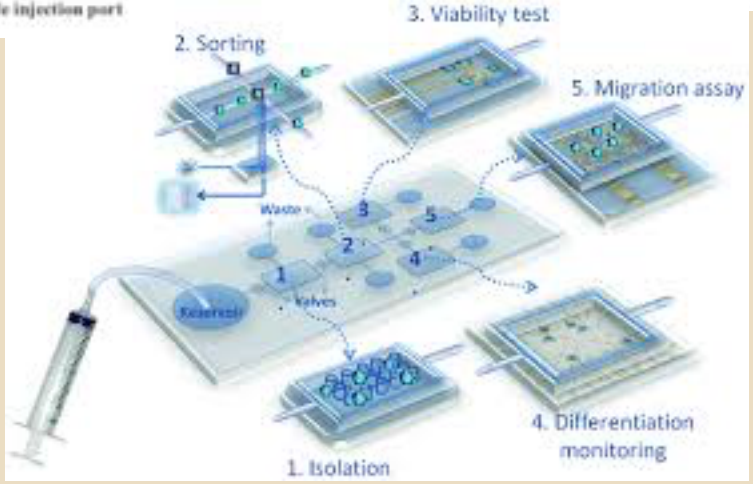
The Future of Health

- Medical progress, state of the art
- LOC-technology (Lab on Chip)





- and it becomes . . .



The Future of Health

- Medical progress, state of the art
- LOC-technology (Lab on Chip)
- a doctor . . . . . in your pocket

The Future of Health

One more step:

- ***Regenerative Medicine***

The Future of Health - 2020-2025

- On the way to a new body
- Humans v.2. - 2025
- Humans v.3. - 2040 (we'll talk about that some other time) - Exponential Medicine/Health & Singularity

On the way to a new body

Starting point: Today's technology:

- We can replace skin, hair, eye lenses, eyelashes, joints (shoulders, elbows, wrists, jaws, hips, knees, toes, fingers), teeth, lips, arteries, hearts/heart valves, limbs and bones, breasts, entire organs – we can even change our sex
- What do we have left?

On the way to a new body

Starting point: Today's technology:

What do we have left?

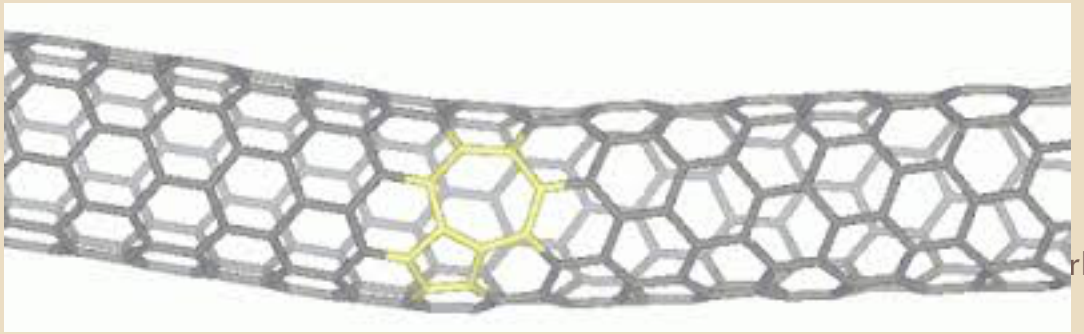
Not much:

- Artificial voice (already on its way)
- 1. Skeleton
- 2. Digestive tract
- 3. Blood (Heart)
- 4. Brain

4 steps to Human v. 2.0

1. A new skeleton

- Our skeleton is a stable structure but . . . it ages and 'crumbles'
- Solution: Gradually introduce, *non-invasively*, nanotubes of superior strength and weight, and slowly replace the calcium-based structure. Human v.2.0 will be very strong, non-aging, and self-repairing



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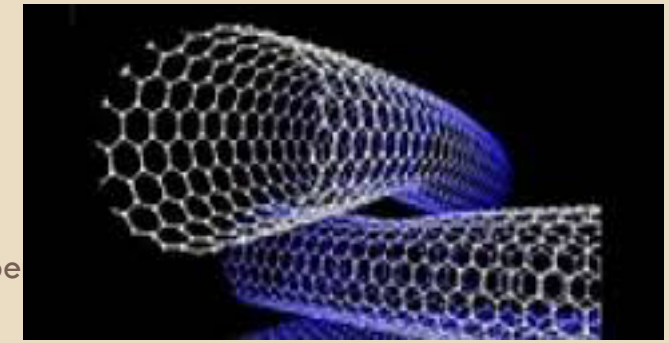
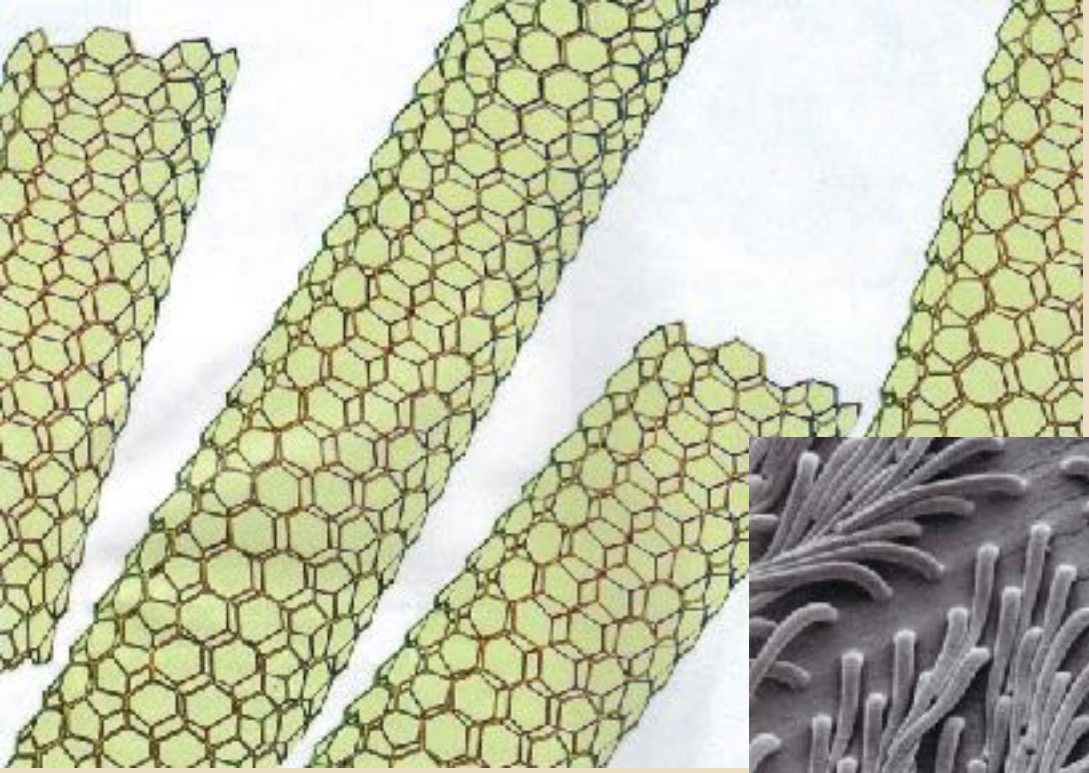
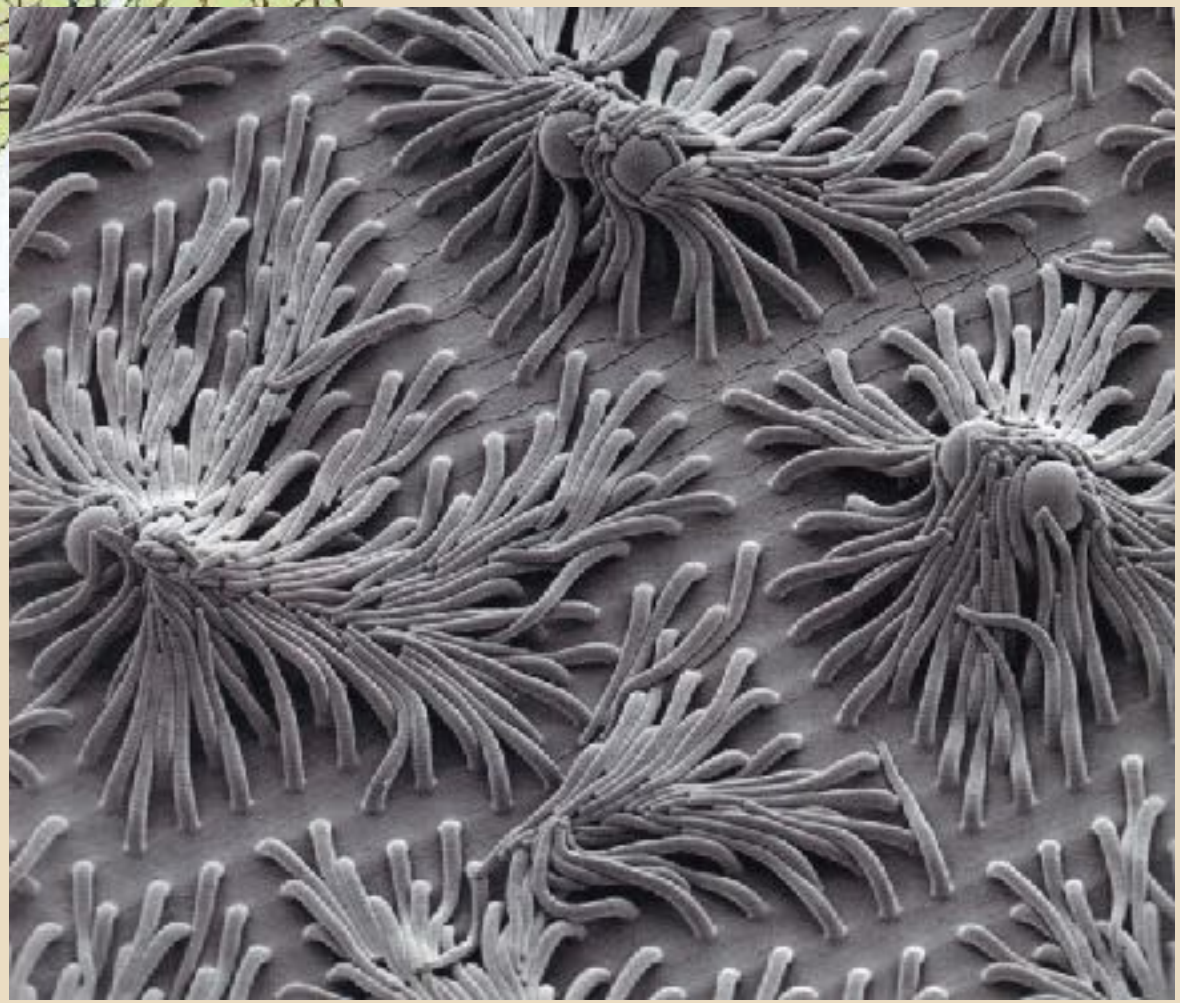




Carbon nanotubes



Polymers (1000 nano)
And polymer spheres

4 steps to Human v. 2.0

2. A new way of eating/digesting

- Just like sex has been separated from its biological function of *reproduction*, we can separate eating from its biological function of *providing everything our body needs*
- How?
- *) pleasure

4 steps to Human v. 2.0

2. cont'd

Short term approach:

- Nanobots in the intestines and in the blood will intelligently measure and
  - extract exactly what our body needs and nothing more,
  - order additional nutrients/supplements as needed, and
  - eliminate the rest

4 steps to Human v. 2.0

2. cont'd

Long term approach

- All nutrients and supplements will be introduced into the bloodstream by nanobots (sensors in the blood and wireless communication to external) *and*

4 steps to Human v. 2.0

2. cont'd

Long term approach

- All nutrients and supplements will be introduced into the bloodstream by nanobots (sensors in the blood and wireless communication to external)
- We will be able to eat anything we wish while optimizing the flow of nutrient in the bloodstream – nanobots will take over the elimination function . . .

4 steps to Human v. 2.0

2. cont'd

Long term approach

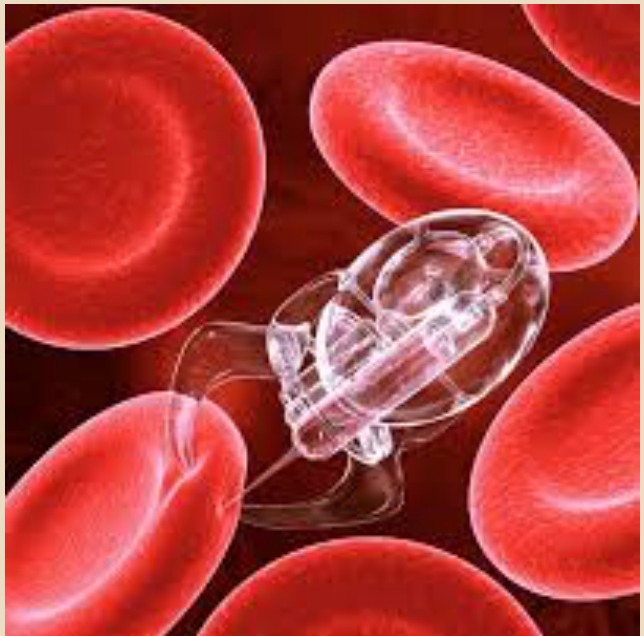
- All nutrients and supplements will be introduced into the bloodstream by nanobots (sensors in the blood and wireless communication to external)
- We will be able to eat anything we wish while optimizing the flow of nutrient in the bloodstream – nanobots will take over the elimination function . . . ***eventually making the digestive tract superfluous***

4 steps to Human v. 2.0

3. New blood

Short term:

- Programmable blood – red blood cells are inefficient; synthetic blood cells – respirocytes – will enable us to go for hours without oxygen (impact on athletics, divers, climbers, general life)
  - Billions of nanobots circulating in our bloodstream
  - will
- correct DNA
- destroy pathogens
- eliminate flaws/errors, eliminating toxins
-



Nanobots

4 steps to Human v. 2.0

3. cont'd

Long term:

- Potentially 100,000 times more efficient* (and with the ability to eliminate CO2), respirocytes** will eventually make lungs superfluous

- * With existing blood, we breathe 5-6 million times per year
- ** With respirocytes we can breathe 10-30 times per year

cont'd

4 steps to Human v. 2.0

3. cont'd

- . . . and with artificial platelets, blood can be *completely replaced*, possibly by non- or semi-fluid based medium (vasculoid)

4 steps to Human v. 2.0

3. To Have Or Not to Have – A Heart

- We can *replace* it today . . . But can we do without it?

Short term:

- Artificial hearts (already in progress)

Long term:

- Nanorobotic vasculoid (*with its own mobility*) will eliminate the need for pumping - and make the heart superfluous!

4 steps to Human v. 2.0

4. The ultimate prize: A non-biological brain

Short term:

- We *already* have implants for various regions of the brain; f.x.:
- MIT/Harvard: replacing the damaged retina-area with neural implants (neuromorphics)
- Next: Centers with implants that reverse effects of Parkinson, cerebral palsy, multiple sclerosis – all by "*treating the circuitry*" rather than adding chemicals to suppress neurotransmitters

4 steps to Human v. 2.0

4. cont'd

Long term

- Ultimately, we will place sensors in the brain that will be programmed to recognize brain patterns associated with intended movements and then stimulate the appropriate sequence of muscle actions
- The result is . . .

4 steps to Human v. 2.0

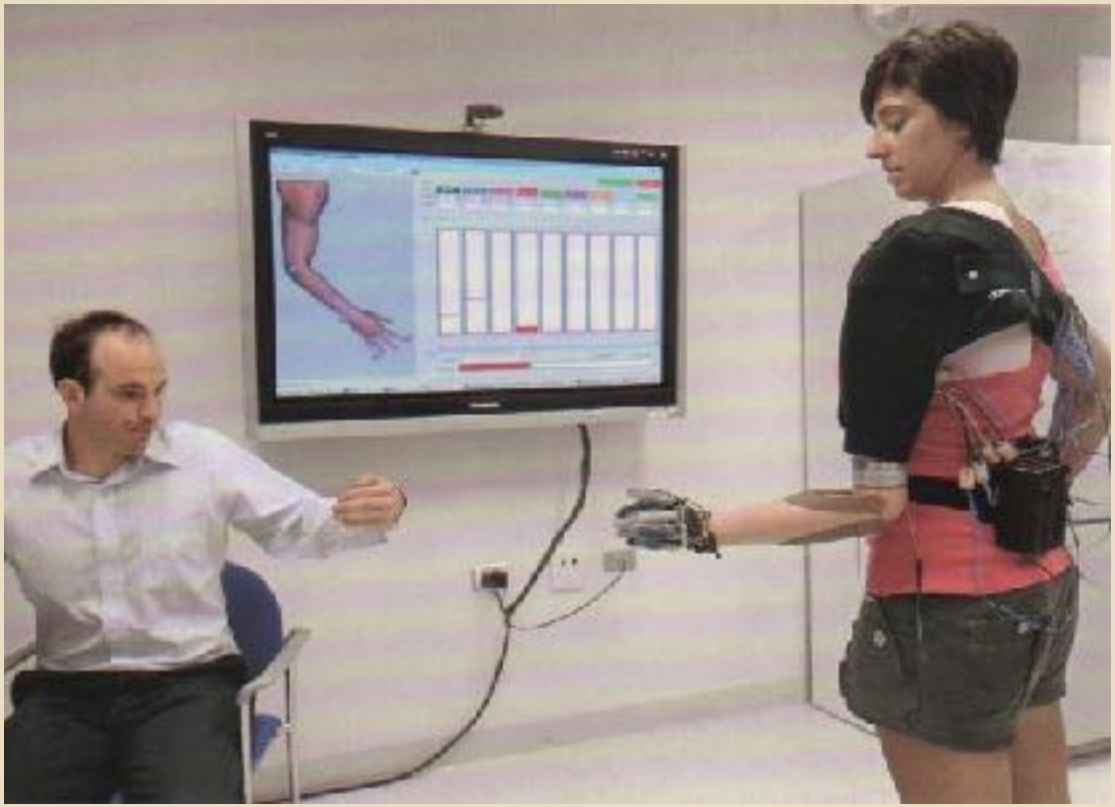
4. cont'd

Long term:

- they can make paralyzed people walk again
- . . . and if the muscles don't work, we'll use nano-electro-mechanical systems (NEMS) that expand and contract the way muscles operate (designs already underway) based on real *or synthetic nerves*

Macro-robotics

Macro-robotics



MODULAR PROSTHETIC LIMB

UP TO 22 MOVEMENTS

Nerves running from the spinal cord (1) will send the brain's commands to electrode arrays implanted in the residual nerves (2). A computer chip on each array sends data wirelessly to a receiver on the skin (3). The receiver wires the data to another chip (4) that decodes the command and wires it to the limb controller in the palm (5), which sets the motors in motion.

CARBON-FIBER HARNESS
Molded to the body, the shell is strong but lightweight.

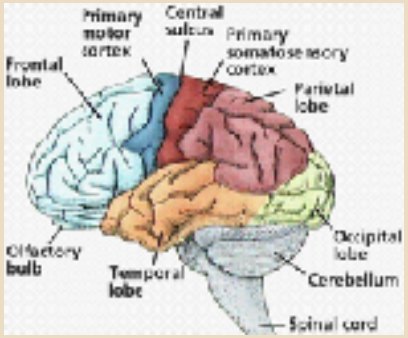
Shoulder rotators

Torben Riise

The Transfer of Thoughts

- Miguel Nicolelis, Duke University - 2013

Test person A



Cap w electrodes

A plays a video game

w/mind only

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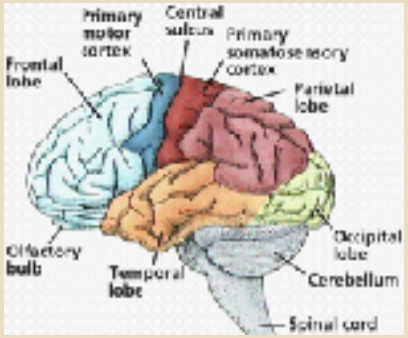
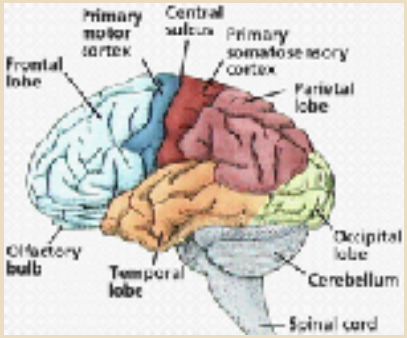
- Miguel Nicolelis, Duke University - 2013

Test person A — 1 mi away — Test person B





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Magnetic coil against left side motor cortex

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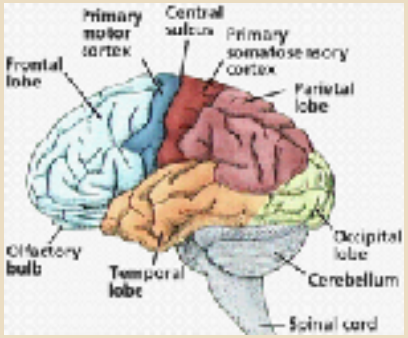

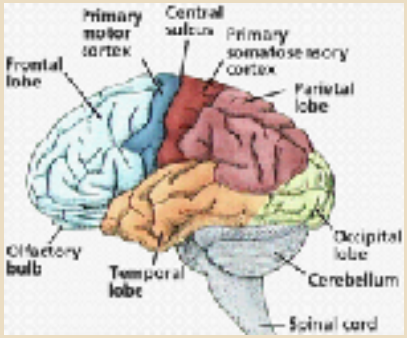

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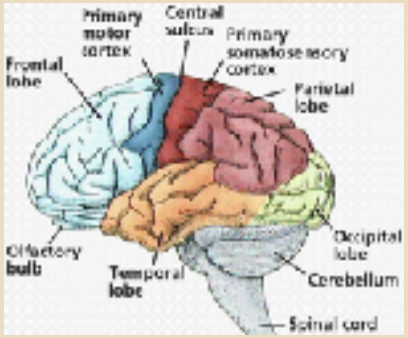

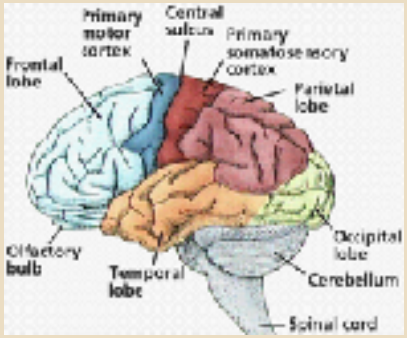

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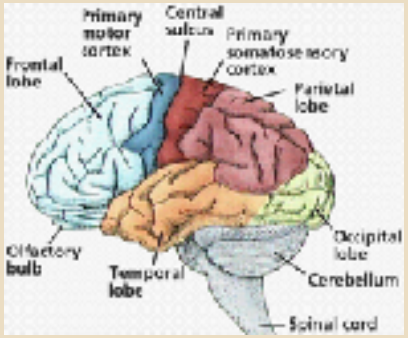


Cap w electrodes

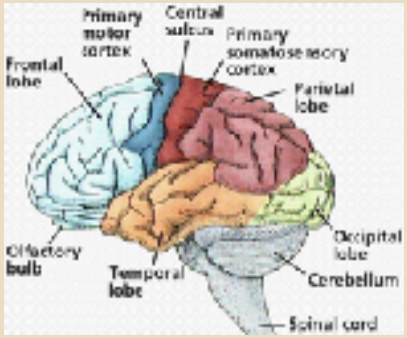
A plays a video game w/mind only

A **imagines** making a move w right hand/finger

Brain signal is sent to computer

1 mi away

Test person B



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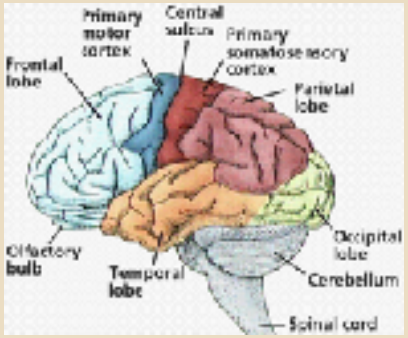

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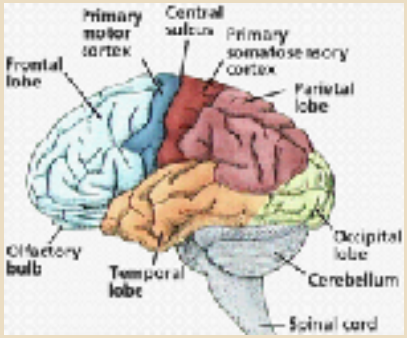

Magnetic coil against left side motor cortex

Stimulates B's brain - causing him to **move his finger**

A closing thought:

If you cling to a static worldview,
you are heading for a serious future shock

The Future of Health

See you in the future

Thank You!

torben.riise@gmail.com