



# Институт Аллана

**Allen Institute for Brain Science**

**United States, Seattle**

2017 - present moment

Scientist I

Costas Anastassiou, Epileptic neural network models based on human data

**University of Washington, Department of Physiology and Biophysics**

**United States, Seattle**

2016 – 2017

Post-doctoral fellow

Adrienne Fairhall, Hydra vulgaris neural network models

**Ecole Normale Supérieure, Department d'Etudes Cognitives**

**France, Paris**

2012 – 2015

PhD student

Boris Gutkin and Anton Chizhov

Modeling of single cell and network phenomena of the nervous system:

Ion dynamics during epileptic oscillations and inverse stochastic resonance

**Computational Physics Laboratory at Ioffe Institute**

**Saint Petersburg, Russia**

2010 – 2012

2007 – 2009

Research-assistant

Anton Chizhov

Adaptation, synchronization and wave solutions in the firing-rate model of population of leaky integrate-and-fire neurons





## Universities

### École Normale Supérieure

Département d'Études cognitives  
2012 - 2015

**PhD in Computational Neuroscience**

### Peter the Great St. Petersburg Polytechnic University

Department of Physics and Mechanics  
2009 - 2011

**Master of Physics**

### Paris Descartes University

Faculty of Medicine  
2009 - 2010, lab rotations

**Master of Research**

### Peter the Great St. Petersburg Polytechnic University

Department of Physics and Mechanics  
2005 - 2009

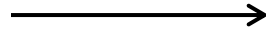
**Bachelor of Physics**



# Мозг

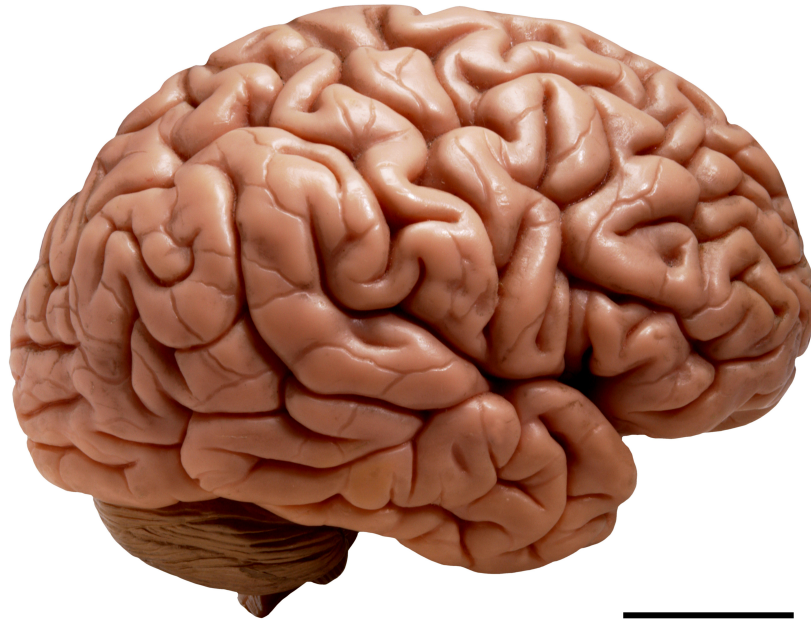
- Brain is a very big place in a very small place

Carl Sagan





# Human brain



5 cm

~86 Billions of neurons

[www.wikipedia.org](http://www.wikipedia.org)

## Milky way galaxy



~200-400 Billions of stars

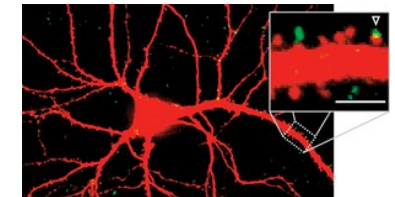
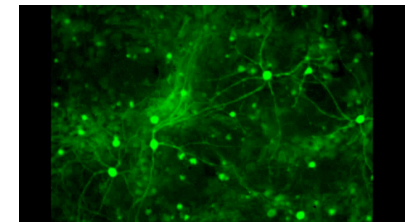
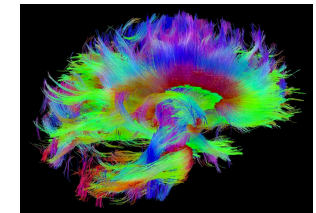
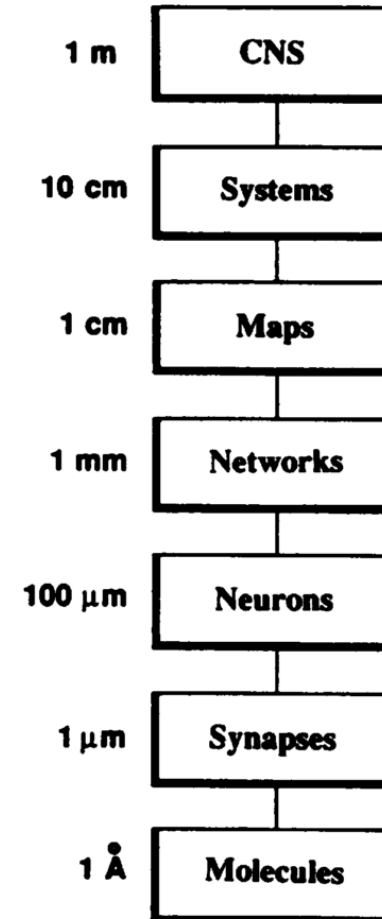
# Human brain



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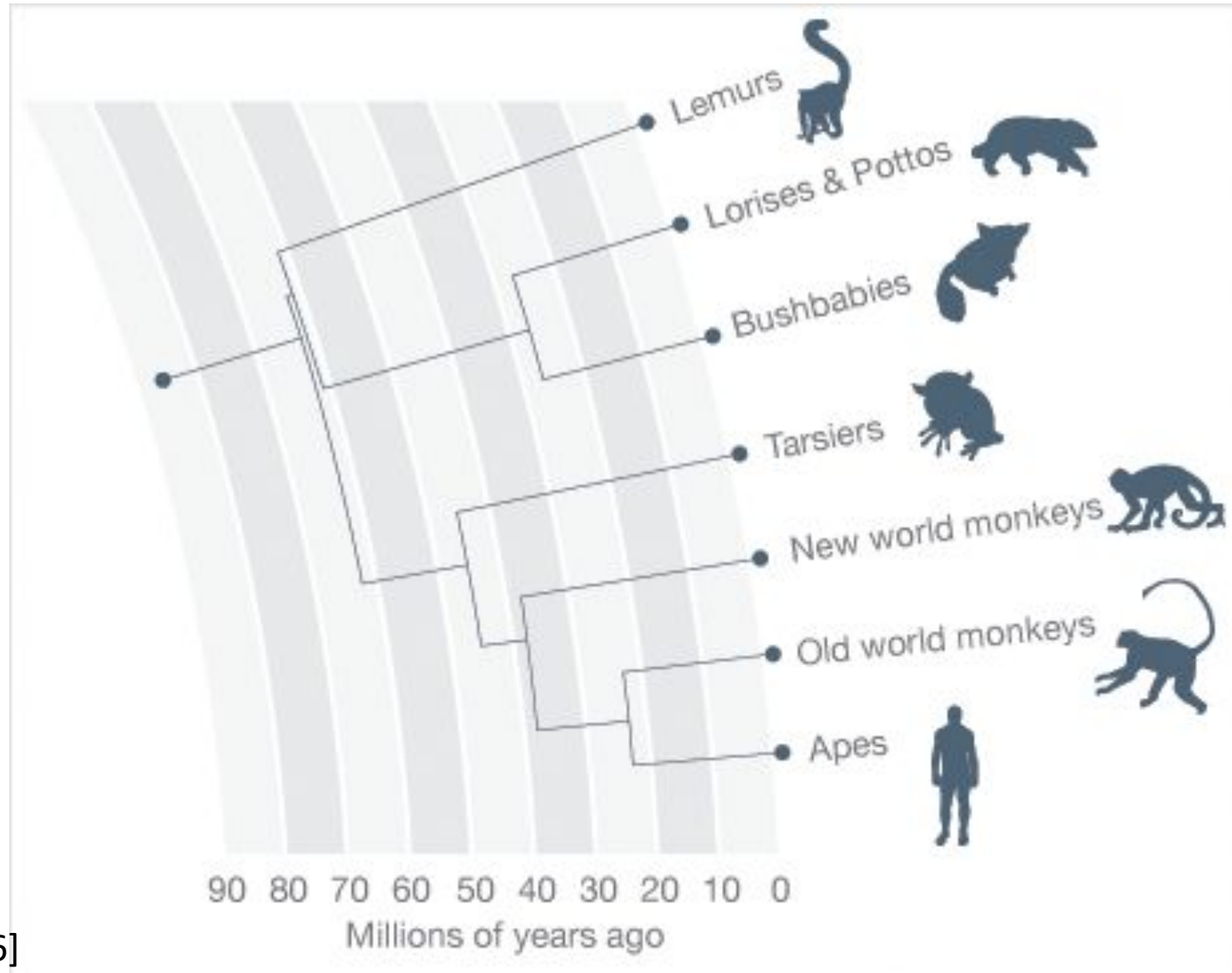
[www.wikipedia.org](http://www.wikipedia.org)



Sejnowski and Churchland, 1988 (Science)

# Эволюция человека

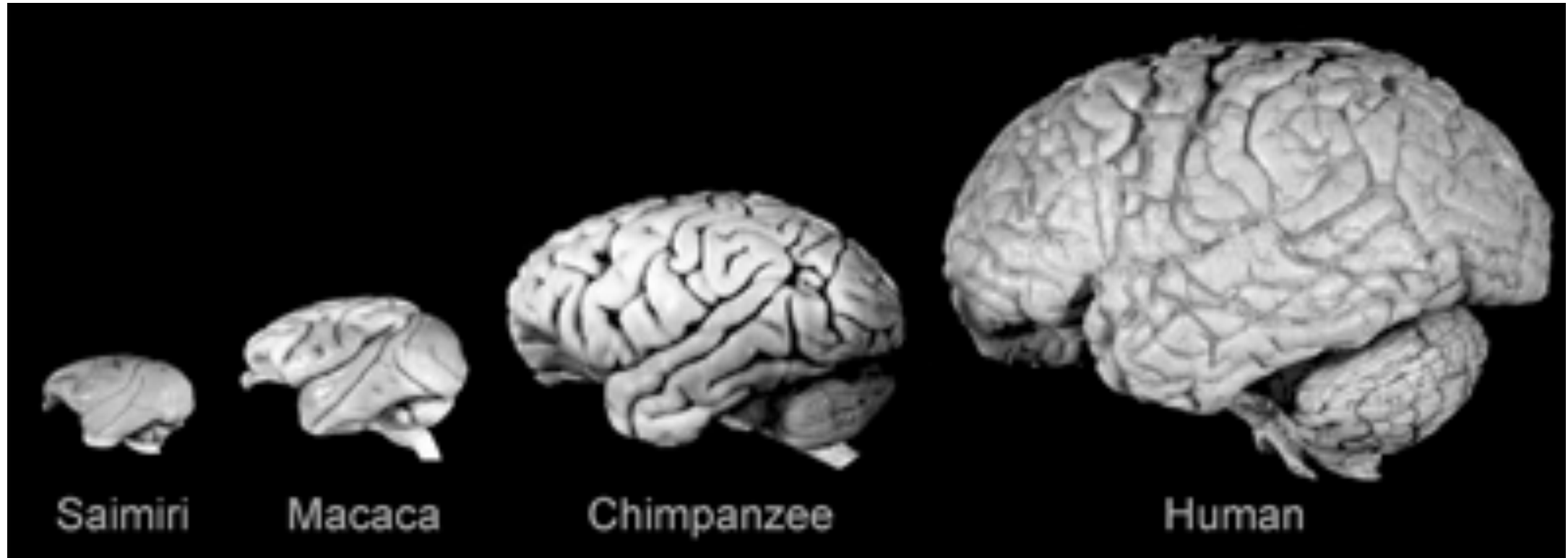
First nervous system  
550 Millions years ago



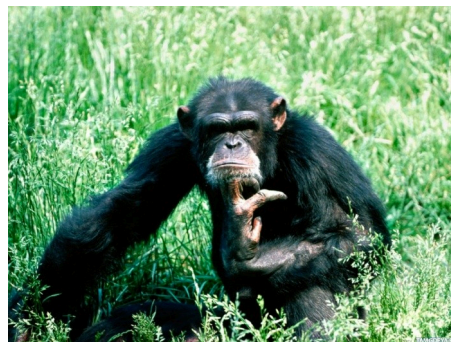
[Steiper and Young, 2006]



# Эволюция коры



<http://www.gettyimages.com/>



[Hofman 2014]

# Allen Institute

## THE BUILDING BLOCKS OF YOUR BRAIN

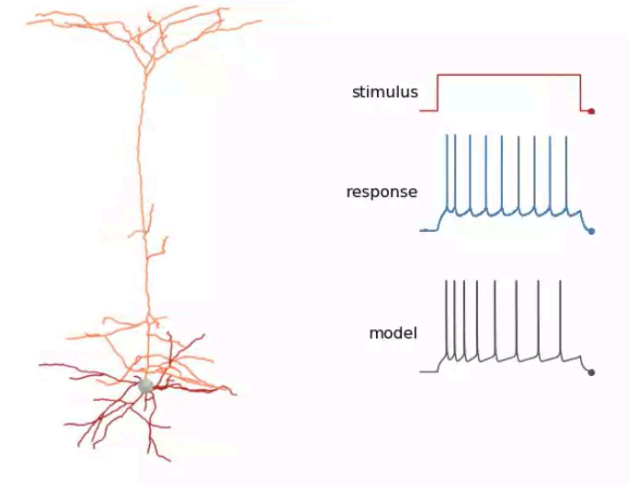
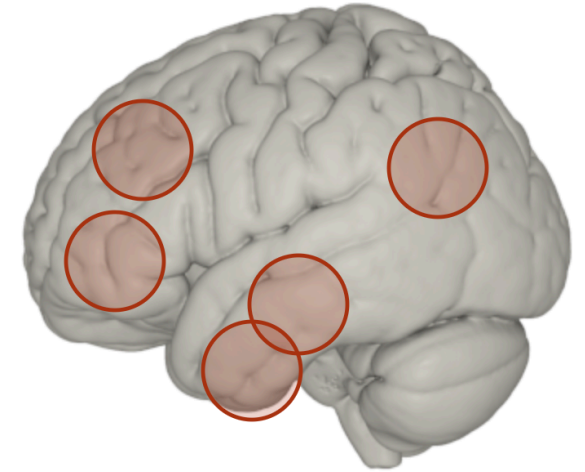
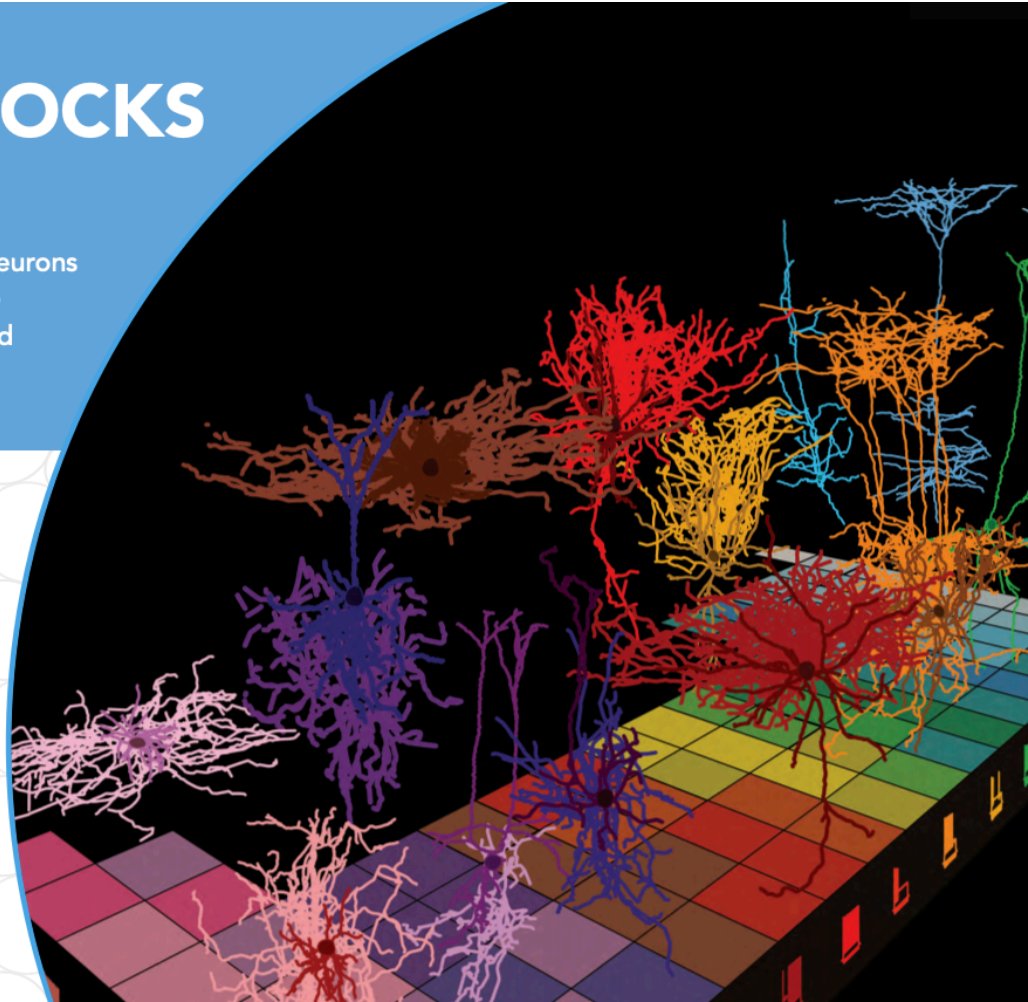
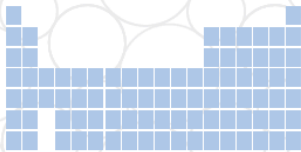
Adult human brains have between **86-100 billion** neurons and every single one is unique. The structure of the neuron helps it communicate with its neighbors, and together they let you move, feel, think and more.

### CLASSIFYING BILLIONS OF NEURONS:

#### A PERIODIC TABLE FOR THE BRAIN

In chemistry, a periodic table categorizes atoms into elements. Scientists at the Allen Institute are working towards a classification system—a periodic table of sorts—for neurons. They're using machine learning algorithms to sort neurons based on their shape, connections, gene expression, and electrical properties.

Many neurological diseases only affect certain types of neurons, so categorization is helpful in developing treatments that target affected cell types.



<https://portal.brain-map.org/>

# Поведение “простых” животных: Гидра - 620 нейронов

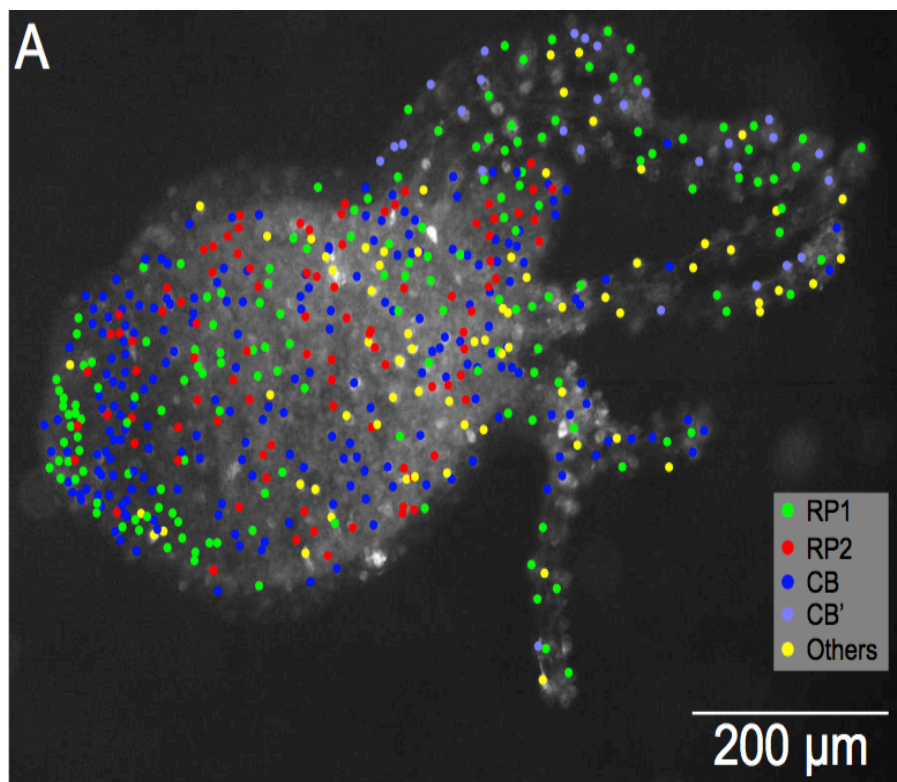
First nervous system  
550 Millions years ago

Hydra nervous system  
is the simplest we know  
today





# Поведение “простых” животных: Гидра - 620 нейронов



[Dupre et al 2017]

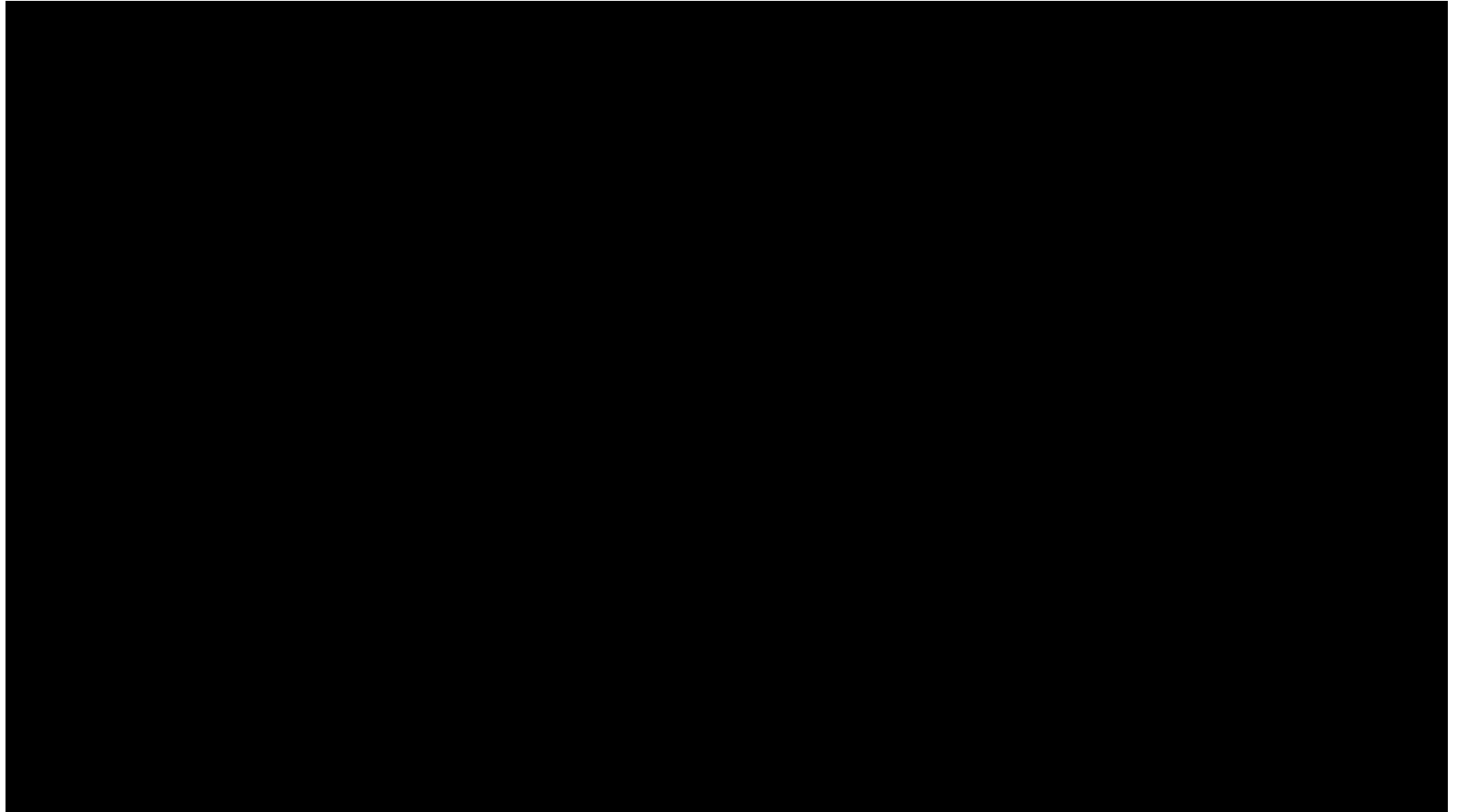
# Поведение сложных животных:

Бонобо  
~6 000 000 000  
нейронов



Поведение  
очень  
сложных  
животных:

Человек  
 $\sim 10^{11}$  нейронов

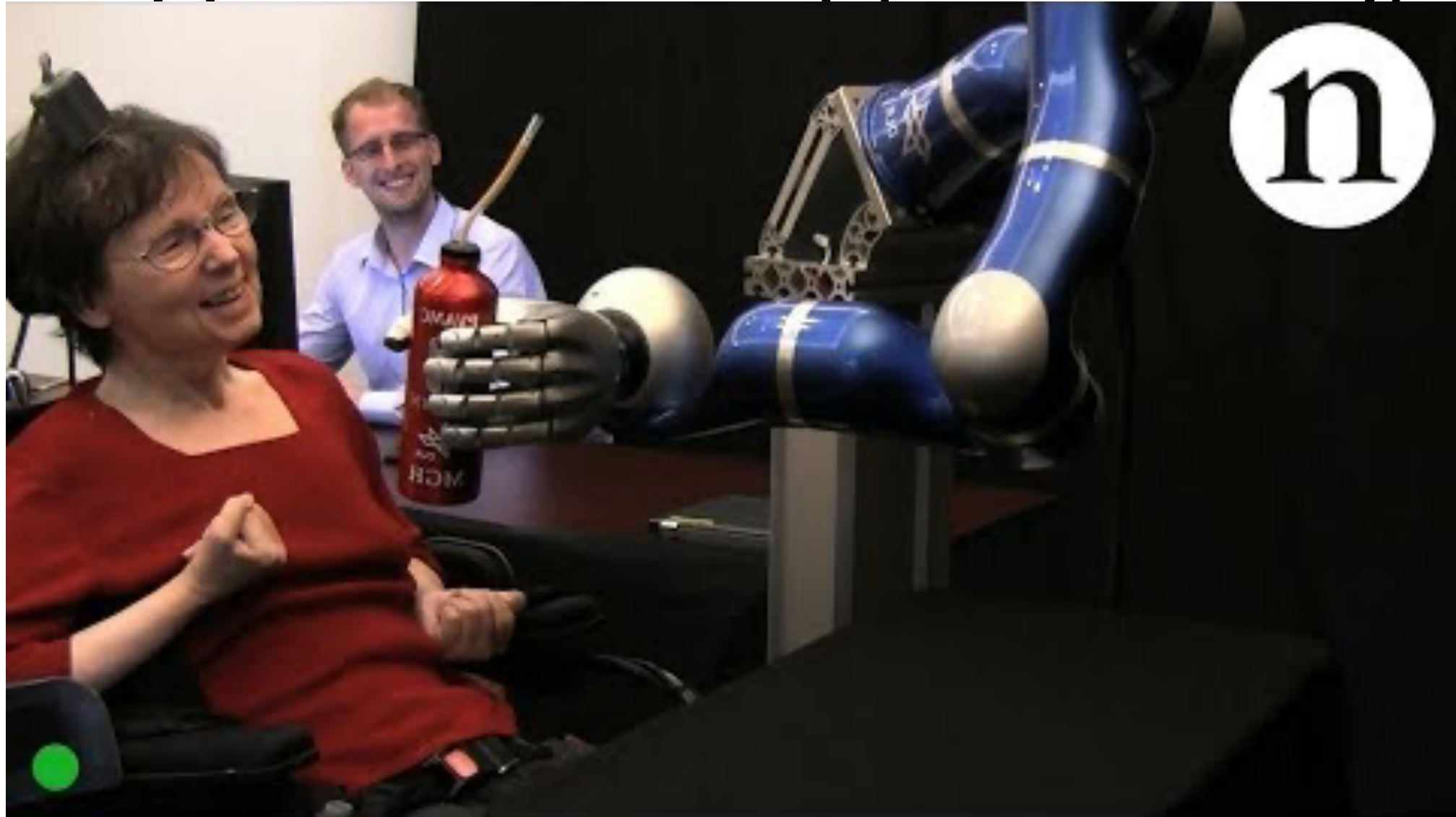




Зачем нужно изучать мозг?  
Чем это может быть нам полезно?

Интерфейс мозг-компьютер

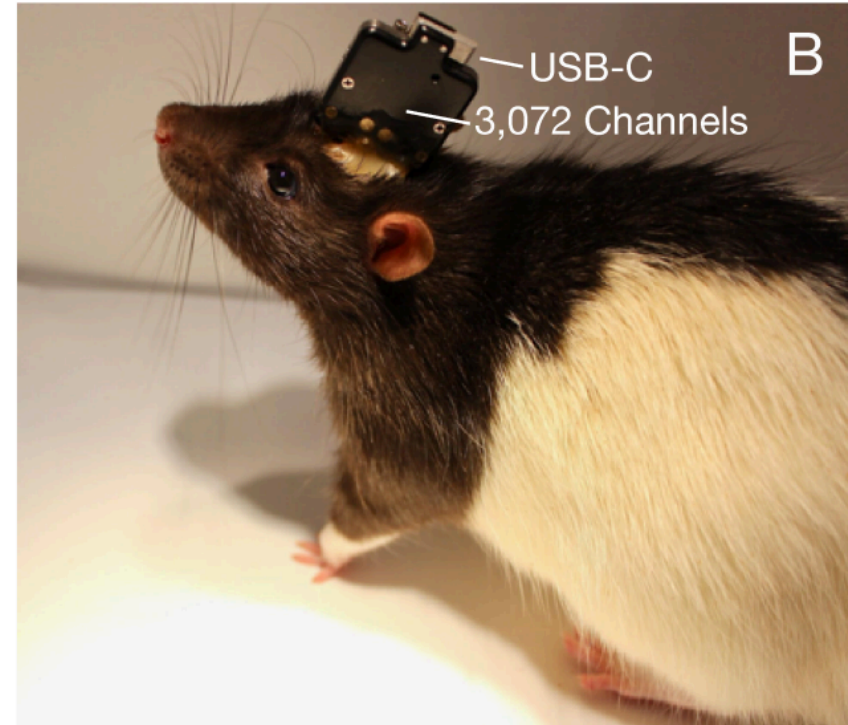
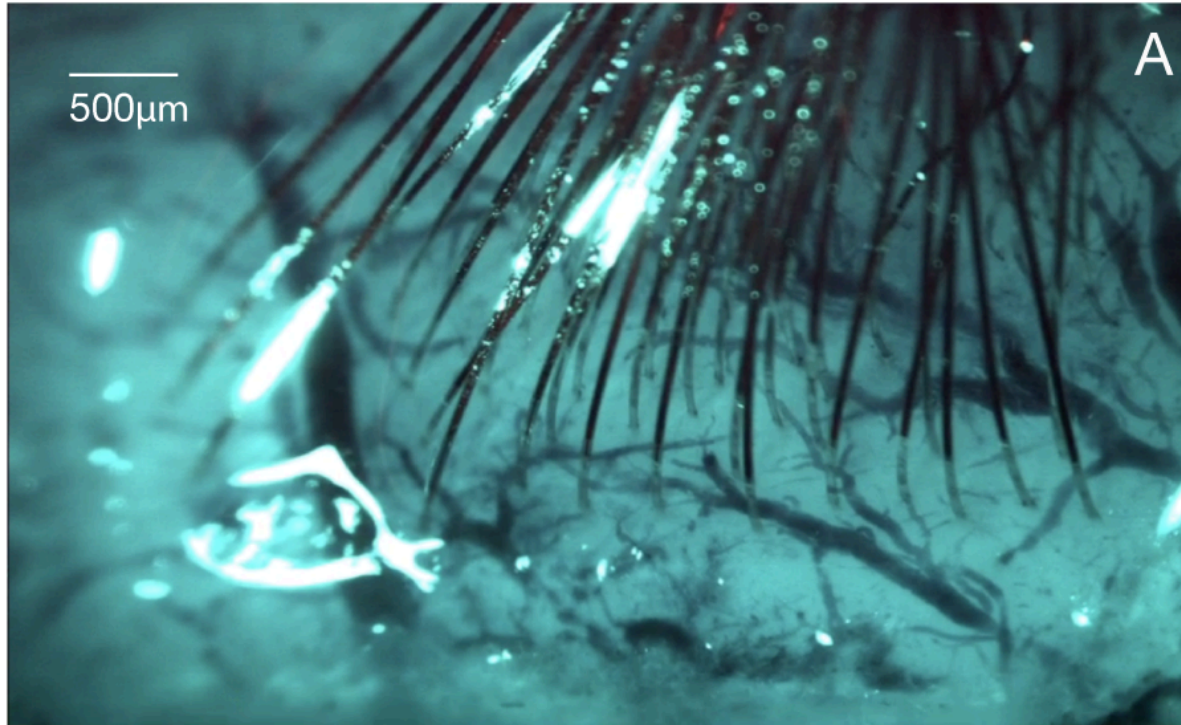
# Интерфейс мозг-компьютер (Brown University)





# Интерфейс мозг-компьютер (Neuralink)

NE



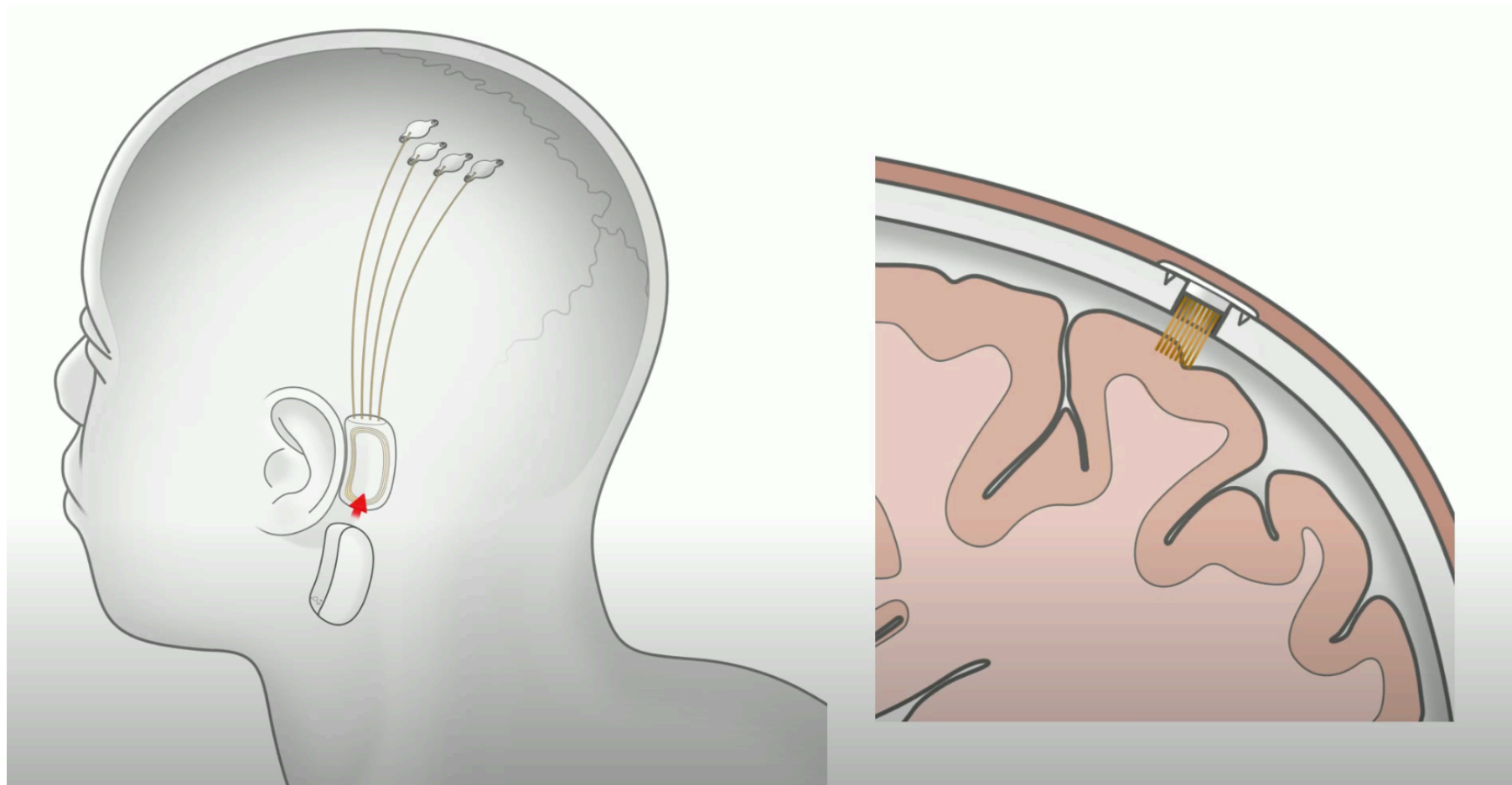
**Figure 6:** Thread implantation and packaging. **A.** An example peri-operative image showing the cortical surface with implanted threads and minimal bleeding. **B.** Packaged sensor device (“System B”) chronically implanted in a rat.

<https://www.youtube.com/watch?v=r-vbh3t7WVI&t=1653s>

# Интерфейс мозг-компьютер (Neuralink)



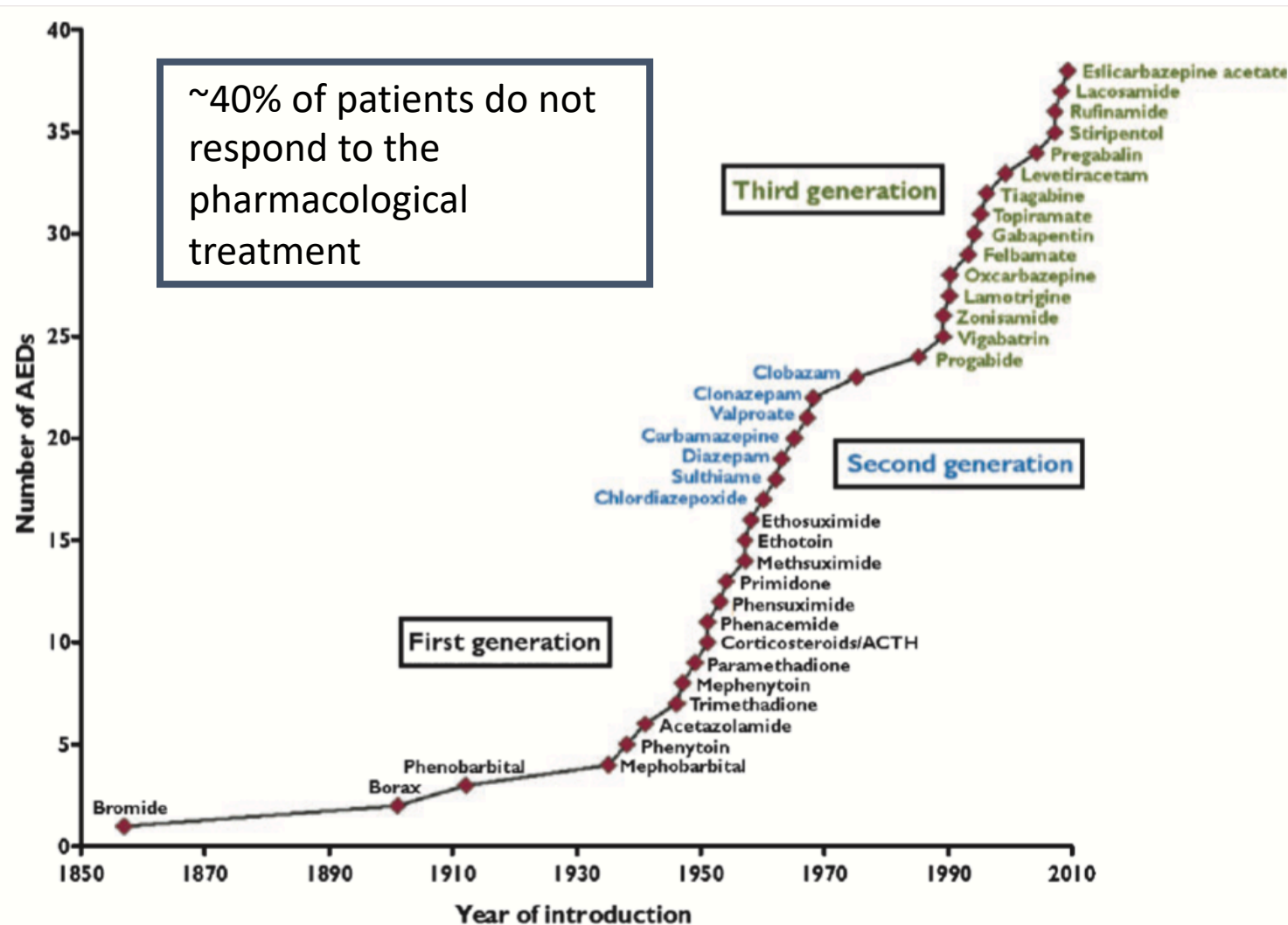
NEURALINK



<https://www.youtube.com/watch?v=r-vbh3t7WVI&t=1653s>

# Лечение неврологических заболеваний

A lot of brain diseases like epilepsy do not have good drugs against it



Löscher and Schmidt 2011

[alleninstitute.org](http://alleninstitute.org) | [brain-map.org](http://brain-map.org)

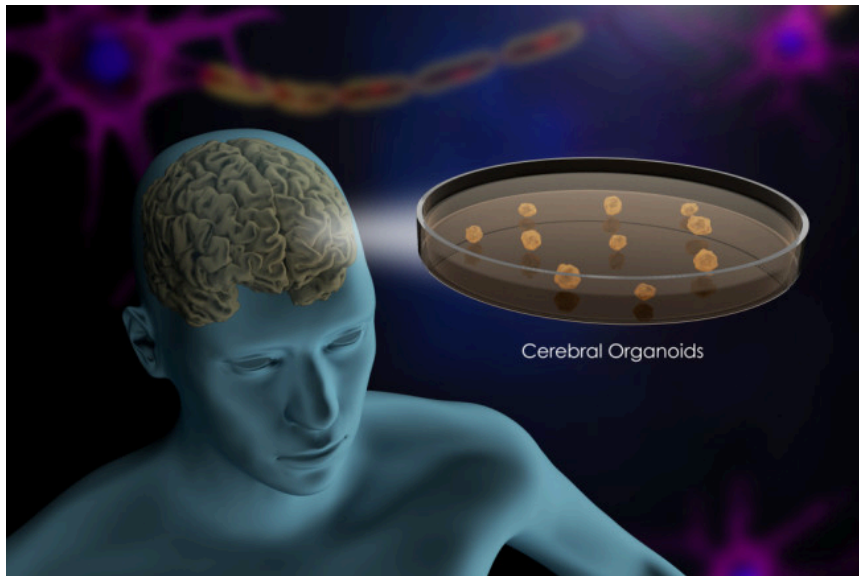
**Mouse epilepsy is the main model of human epilepsy**



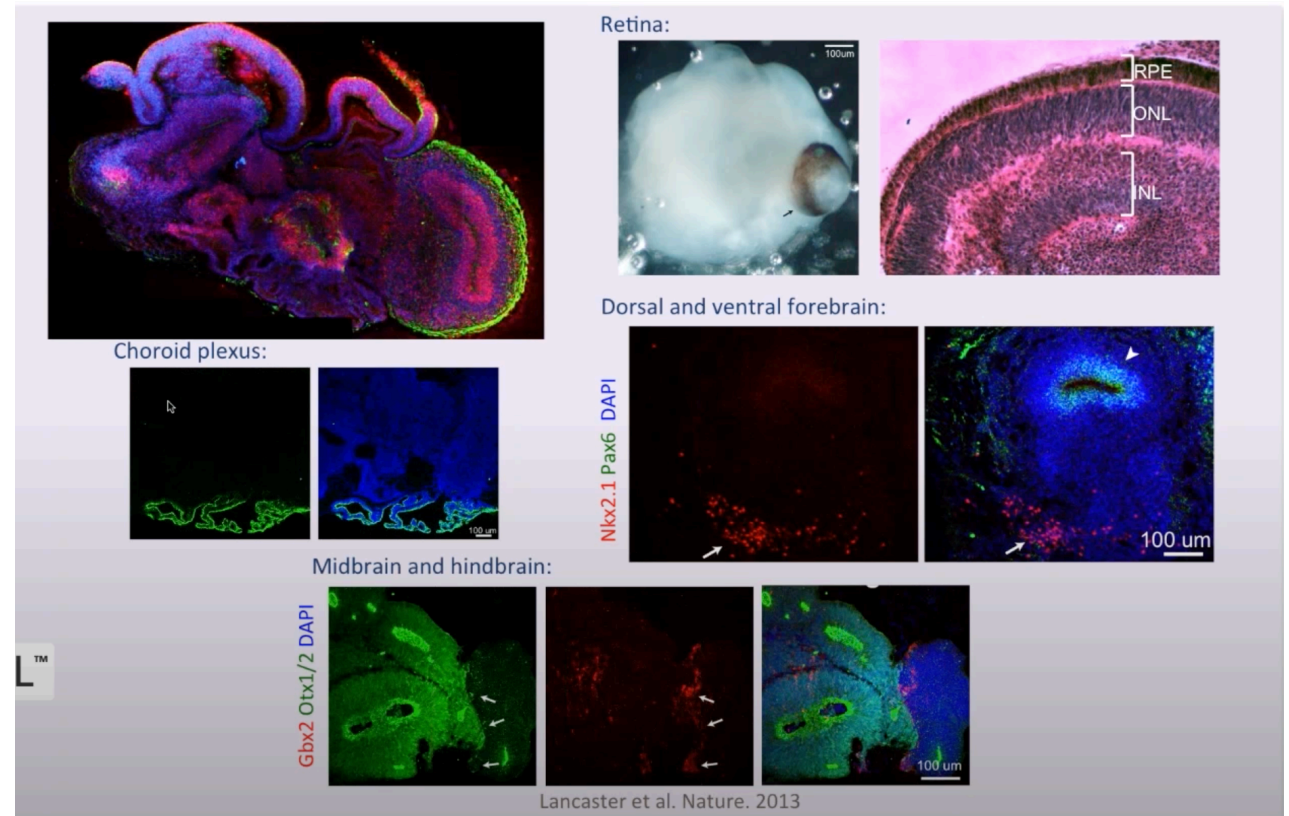
[healthcare.utah.edu](http://healthcare.utah.edu)



# Поиск новых лекарств с помощью органоидов мозга (system1 bioscience)



<https://www.discovermagazine.com/>



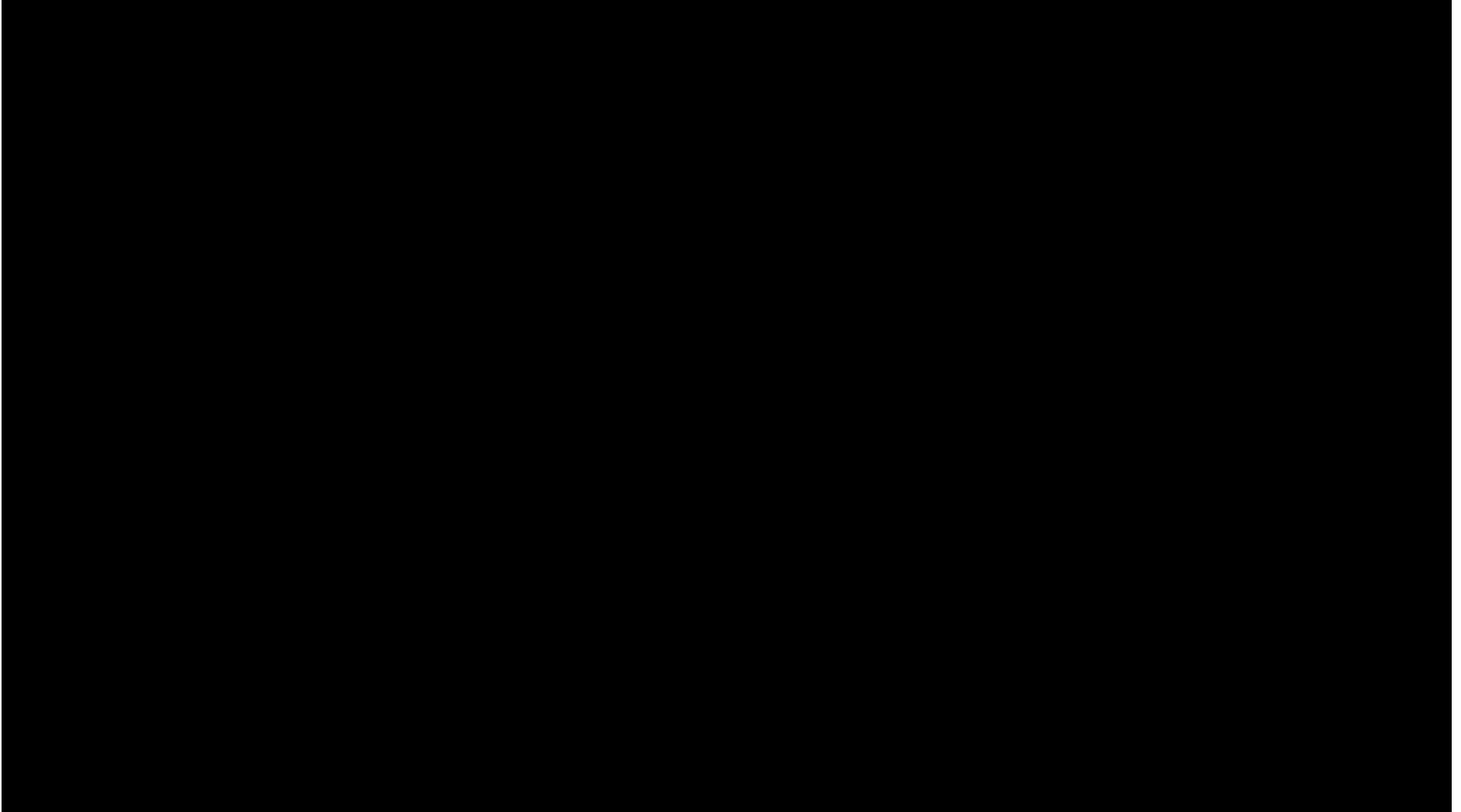
Drug testing

<https://system1.bio/>

[https://www.youtube.com/watch?time\\_continue=3&v=tZqVo-yJwQ8&feature=emb\\_logo](https://www.youtube.com/watch?time_continue=3&v=tZqVo-yJwQ8&feature=emb_logo)

Понимание человеческого языка

# Язык, что это такое? (Berkeley, Gallan Lab)



# Работа ученого

- Исследования (проведение и анализ экспериментов)
- Обсуждения с другими учеными
- Чтение статей
- Написание своих собственных работ
- Подача заявок на финансирование исследований
- Обсуждение результатов на научных конференциях
- Участие в популяризации науки



**Society for Neuroscience meeting  
30 000 participants**





## THANK YOU

We wish to thank the Allen Institute for Brain Science founders,  
Paul G. Allen and Jody Allen, for their vision, encouragement and support.

[alleninstitute.org](http://alleninstitute.org)  
[brain-map.org](http://brain-map.org)



ALLEN INSTITUTE *for*  
BRAIN SCIENCE