

Presidential Commission for the Study of Bioethical Issues

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Chief Scientific Officer

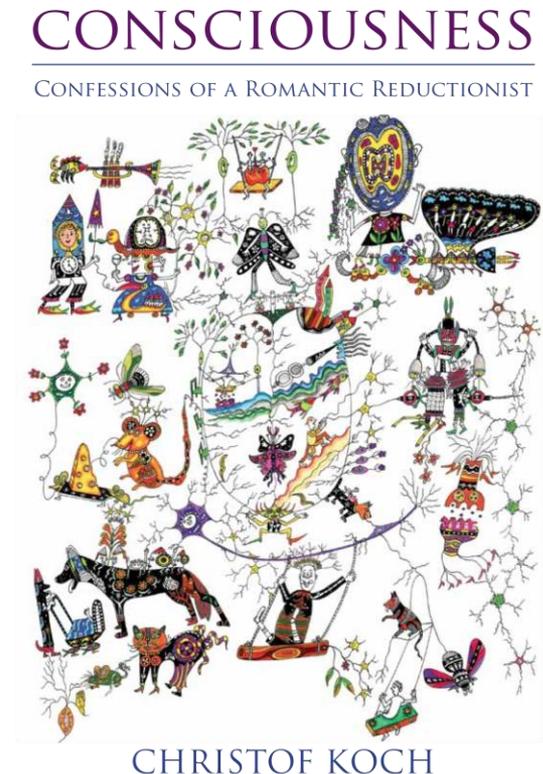
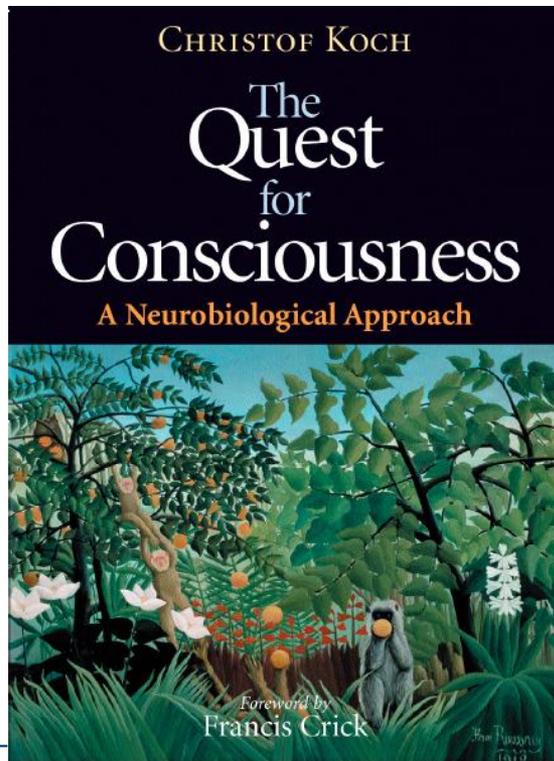
Who we are

- An independent, non-profit research organization working to support basic research in the brain sciences (founded in 2003 by Paul G. and Jody Allen)
- Dedicated to open science - generating tools and information for the scientific community (2 PB; > 10^6 microscopic slides; > 5000 mice)
- All data is freely and publicly available at www.brain-map.org, without any commercial restrictions, 1-2 years prior to publication
- Project-focused, milestone driven
- Multi-disciplinary teams working towards a common goal (math, physics, engineering, systems-level and molecular neuroscience, molecular biology, genetics, genomics, information technology)
- Now ca 225 staff (55 PhDs), moving to 500
- Based in Seattle, Washington. Moving to a single new 260,000ft² building in 2015

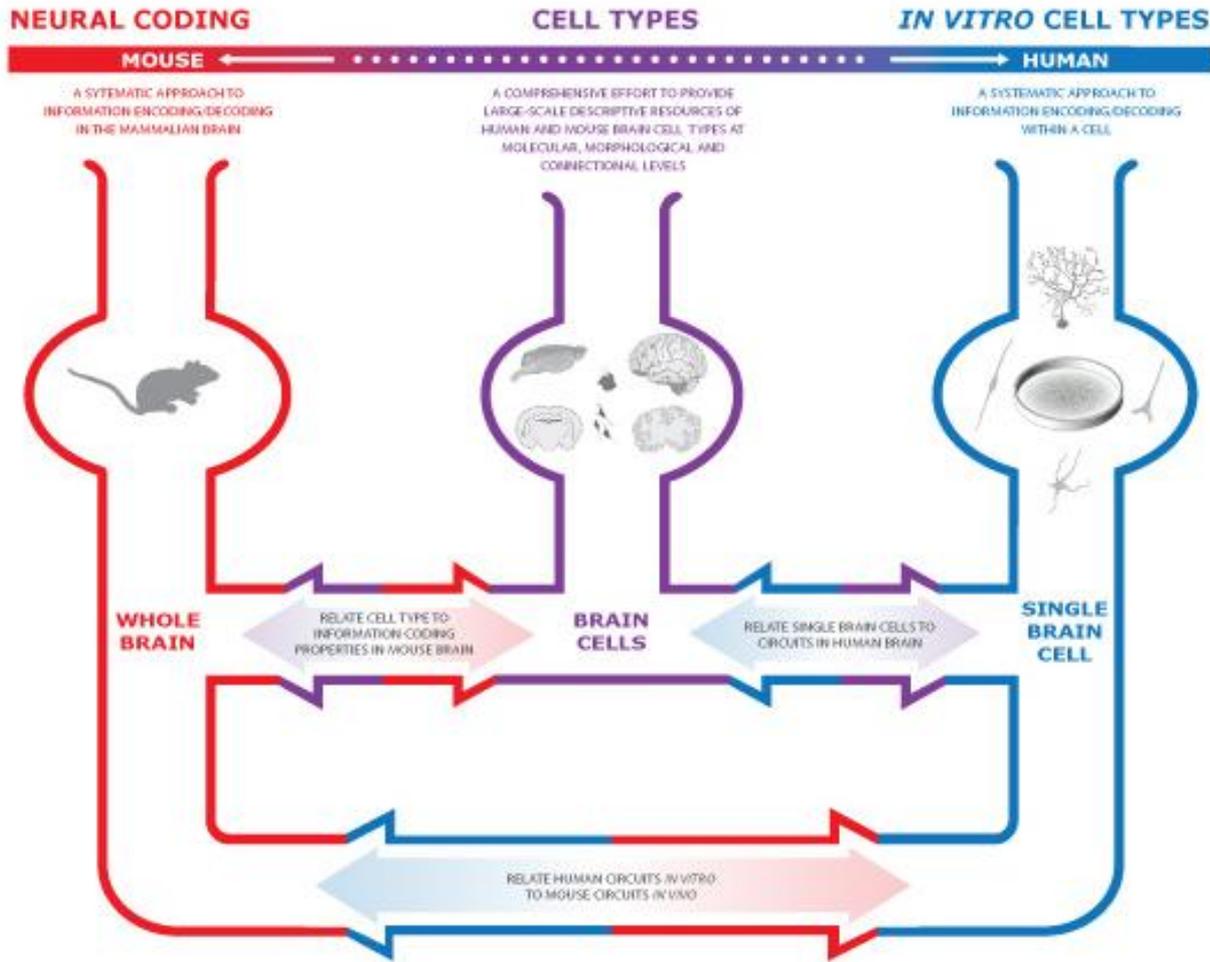


Who I am

- From 1986 until 2013, Professor of Biology and of Engineering and Applied Science at the California Institute of Technology in Pasadena
- Since 2011 the Chief Scientific Officer at the Allen Institute
- My laboratory studied how single nerve cells process information, and the neuronal basis of visual perception, selective visual attention and the physical basis of consciousness (together with Francis Crick)
- Published > 350 papers in peer-reviewed literature and numerous books



Our 10-year vision (launched March 2012)



Ethical Considerations:

- Invasive experiments in behaving rodents (IACUC)
- Postmortem human brain
- Prenatal human tissue
- **Surgical excised tissue**
- **Human stem cells**

Ethical Considerations: Human Tissue and Cells

- A number of ethical considerations are common to human-focused research programs at the Allen Institute:
- **Informed Consent** - Adequate communication of benefits and risks of research
- **Privacy** - Public availability of genomic and genetic information may lead to loss of privacy and identifiability
- **Communication** - Next-of-kin and other surviving family members, many of whom will not have participated directly in consent, may be impacted by identification or by health or medical information that comes to light based on research.

Surgical Excised Tissue

- Characterization of human neocortex from tissue excised as part of neurosurgery to
- Characterize the cellular morphology, electrical behavior and gene expression of single human nerve cells
- Image neural activity throughout the excised neocortical tissue

Note

- Research involves keeping neurons alive long enough to characterize functional physiology (typically < 1 day). Chronic cell cultures may last for days, but without organized large-scale neuronal activity

Human Stem Cells

- Understand the developmental trajectory of human cortical cell types derived from embryonic stem cells (from approved cell lines) or induced pluripotent stem cells from volunteers or patients and develop tools and techniques to construct human cortical or cortico-thalamic circuits

Additional Ethical Considerations

- The ability to direct stem cells to form large circuits (e.g. a cortical column) raises the question of whether these networks can experience any conscious sensations, in particular in the presence of large-scale and coherent neuronal activities (e.g. waves, fast oscillations)
- Examples - Cerebral organoids (Lancaster *et al Nature* 2013; Kadoshima *et al. PNAS* 2013)
- This will be an increasingly relevant issue over the coming years