Docket #: S10-309

MRI - Optogenetic Functional Magnetic Resonance Imaging

Researchers in Prof. Karl Deisseroth's laboratory have combined optogenetics with functional magnetic resonance imaging (fMRI) to enable highly specific in vivo analysis of brain circuits. This technology allows the visualization of the causal effects of specific cell types defined not only by genetic identity and cell body location, but also by axonal projection target. This approach could be used to map the global effects of controlling a local cell population. ofMRI may accelerate the search for global circuit-disease endophenotypes as well as the dynamical mapping and reverse engineering of intact neural circuitry to potentially revolutionize therapy discovery efforts for all neurological diseases.

Related Optogenetics Inventions
The Deisseroth Laboratory has developed a wide variety of optogenetics tools, including opsin genes, medical devices, animal models, and screens. Additional information on these technologies can be found by clicking on the “more technologies from Karl Deisseroth” link below.

Applications

- **Research** - tool for studying neurological disorders to:
    - elucidate disease phenotypes
    - map and reverse engineer neural circuitry
- **Screening** for therapeutic interventions, including cell, gene, pharmaceutical and behavioral treatments

Advantages

- **In vivo analysis** of circuits

- **Cell-type specific** stimulation and monitoring
- **Maps global effects** of controlling a local cell population

Publications

- Lee JH, Durand R, Gradinaru V, Zhang F, Goshen I, Kim DS, Fenno LE, Ramakrishnan C, Deisseroth K, "Global and local fMRI signals driven by neurons defined optogenetically by type and wiring. *Nature.* 2010 Jun 10;465(7299):788-92.

Patents

- Published Application: 20120165904
- Published Application: 20130289386
- Published Application: 20140323849
- Published Application: 20160270723
- Published Application: 20170160360
- Published Application: 20180364323
- Published Application: 20190377045
- Issued: 8,696,722 (USA)
- Issued: 8,834,546 (USA)
- Issued: 9,271,674 (USA)
- Issued: 9,615,789 (USA)
- Issued: 10,018,695 (USA)
- Issued: 10,371,776 (USA)
- Issued: 10,914,803 (USA)

Innovators

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