Controlling brain circuits with light

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F1000 Biology Reports, the open-access, peer-reviewed journal from Faculty of 1000, today published a historical account of the beginnings of the optogenetic revolution by Edward Boyden.

Commenting on Edward Boyden's article, Ben Barres, Head of the Neuronal & Glial Cell Biology Section of Faculty of 1000 and Professor at Stanford University School of Medicine said: "There will probably be a Nobel prize for optogenetics someday as it has revolutionized our attempts to understand how the brain works. This article provides a fascinating insight into the birth of optogenetics and the roles of the major players."

The invention of optogenetics literally sheds light on how our brains work. Published in the May 2011 issue of *F1000 Biology Reports*, Edward Boyden's revealing article gives a unique perspective on the birth of optogenetics tools, new resources for analyzing and engineering brain circuits. These 'tools' take the form of genetically encoded molecules that, when targeted to specific neurons in the brain, enable their activity to be driven or silenced by light, thus revealing how entire neural circuits operate.

By driving or quieting the activity of defined neurons embedded with an intact neural network, Boyden and his colleagues are able to determine what behaviors, neural computations, or pathologies those neurons were sufficient to cause or what brain functions, or pathologies, these neurons are necessary for.

These tools are also being explored as components of neural control prosthetics capable of correcting neural circuit computations that have gone awry in brain disorders. Part of a systematic approach to neuroscience that is empowering new therapeutic strategies for neurological and psychiatric disorders, optogenetic tools are widely accepted as one of the technical advances of the decade, and could one day be used to treat neurological disorders such as Parkinsons.

Using primary sources and his own experiences at Stanford, Boyden reconstructs a compelling case study of the development of optogenetic tools, providing an insight into the hard work and serendipity involved.

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