Bioengineering technology for fast optical control of differentiation and function in stem cells and stem cell progeny

Grant Award Details

Bioengineering technology for fast optical control of differentiation and function in stem cells and stem cell progeny

Grant Type: New Faculty I

Grant Number: RN1-00535

Investigator:

Name:	Karl Deisseroth
Institution:	Stanford University
Type:	PI

Human Stem Cell Use: Embryonic Stem Cell

Award Value: $2,424,209

Status: Closed

Progress Reports

Reporting Period: Year 2

View Report

Reporting Period: Year 3

View Report

Reporting Period: Year 4

View Report

Grant Application Details

Application Title: Bioengineering technology for fast optical control of differentiation and function in stem cells and stem cell progeny

Public Abstract:	Embryonic stem (ES) cells potentially could provide clinically important replacement tissue for central nervous system (CNS) disease treatment, and regenerative medicine approaches involving ES cells have been suggested for common CNS disorders. But it has been difficult to produce the right kind of replacement tissues from ES cells because the “differentiation”, or cell-type specification process, takes many days to weeks, during which time many different stimuli and signaling molecules need to be physically applied to the stem cells. This process of “stem cell differentiation” is slow, costly, laborious, variable, prone to error and contamination, and ultimately rate-limiting in the long road leading to clinical translation. We propose to develop and apply fast, inexpensive, and robust optical technologies to the fundamental problem of stem cell differentiation and regenerative medicine, with particular focus on CNS disease.
Statement of Benefit to California:	Neuropsychiatric diseases like Parkinson’s disease and major depression are leading causes of disability and death in California and worldwide. They are difficult to treat, poorly understood, and devastating for patients, families, and society as a whole. Our proposed fusion of engineering technology with clinically-inspired stem cell technology represents a unique opportunity, which we anticipate will lead not only to fundamentally new, potent, and specific therapies for diseases representing major burdens for the state, but also to engineering and medical commercial ventures that will add resources, money, and skilled jobs to the robust and growing state economy.