Senior Design Project Description for FALL 2016
Project Title: Development of Nanoplasmonic Aptasensor for Neurodegenerative Disorders

Supporter: UNC Charlotte MEES
Supporter Technical Representative: ASSIGNED

Faculty Mentor: _X_ ASSIGNED ___ TBD (check one)
Single Team _X_ Dual Team ___ (check one)
Personnel (EN/ET): ___ E, ___ Cp, ___ Cv, _1_ M, ___ SE
(Complete if the number of students required is known)
Expected person-hours: (250 per student)

Description of Project:

Upon failing to maintain homeostatic levels of neurotransmitters, neuronal communication is interrupted and pathological signatures can develop with age, for example, Alzheimer's disease (AD) and Parkinson's disease (PD). The objective of this project is to develop a novel probe detecting neurotransmitters secreted from live neuron cells and report the progression of neurodegenerative diseases at early stage.

Initial Project Requirements (e.g. weight, size, etc.):

The probe will be composed of multiple aptamers immobilized on a gold nanoparticle (GNP). Each aptamer is comprised of oligonucleotide sequences specifically designed for capturing certain neurotransmitters including dopamine for PD, A-beta, and tau for AD and is structured with a spinach conformation for capturing a fluorescence dye upon target binding. The binding event is reported by imaging the captured and amplified fluorescent signals through surface plasmonics induced on GNP surface. Additionally, populations of three different aptamers with different colors on a single GNP will allow multiple target detection. The nano-sized probe can be easily internalized inside cells or attached to cellular membrane of live neurons and would become a beacon reporting the level of disease in a real time through cellular lifetime.

Expected Deliverables/Results:

The deliverable will be a functional prototype. A report showing the results of all the measurements and tests is required.

List here any specific skills or knowledge needed or suggested (If none please state none):

Student must be MEES student with Bio concentration and need experiences of biosensor design, biomolecular detection, and knowledge in aptamer, neurodegeneration, neurosciences.