Medical Applications of Ultrasensitive Optically-Pumped Magnetometers

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Detection of the magnetic fields produced naturally by the body can provide important functional and diagnostic information. In particular, the study of magnetic signals from the brain, i.e. magnetoencephalography (MEG), has become one of the most important techniques in brain research due to its excellent combination of spatial and temporal resolution. Unfortunately, the dissemination of MEG and other applications of biomagnetism have been impeded by the high cost and impracticality of the instrumentation, which currently relies on superconductor devices, known as SQUID magnetometers. A recent breakthrough in optically-pumped magnetometers (OPMs) promises to change this situation. OPMs show sensitivity similar to that of SQUIDs but are less expensive and dont require liquid helium. These magnetometers are especially cost-effective for applications that only require a small number of sensors. My group has been focusing on the use of magnetocardiography for diagnosis and management of life-threatening cardiac arrhythmia in the fetus. In this talk I'll give an overview of the current status of biomagnetism technology and describe our efforts to construct a low-cost fetal magnetocardiography system based on OPM sensors.