

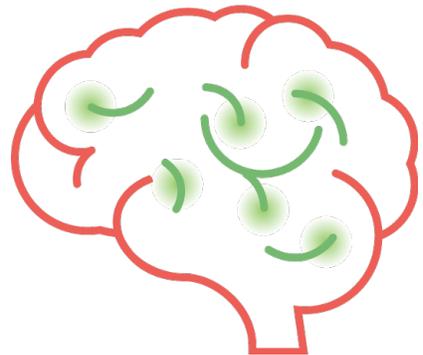


# Life Altering Science

Nov 2018

## A bright idea: the development of an optical sensor for studying neuron signaling

Neuroscientists have been on a long quest to crack the mystery of the human brain—to understand how this complex organ orchestrates feelings, behaviours and actions. Much of what we currently know comes from looking at the brain’s electrical signalling patterns. And recently, technologies like fMRI have allowed us to determine at a high-level, what parts of the brain are responsible for what actions. Now for the first time, scientists have created a technique that allows us to watch neurotransmitters as they are released and absorbed between the neurons of the brain in real time and in response to environmental stimuli. The technique involves the new field of optogenetics, which uses genetic engineering to introduce light emitting and light sensing molecules into brain cells. When these light molecules are used as switches and sensors, it becomes possible to monitor how neurons are communicating with each other at a molecular level. Researchers recently demonstrated this “biosensor” technology to study neurotransmitter fluctuations in the brain cells of mice.

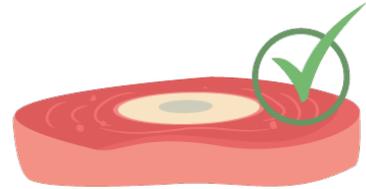




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## An advance in synthetic biology that's making it easier to digest



A clinical stage biotech in the US has engineered live bacteria that can colonize a patient's gut and make an essential nutrient that the patient's body can't make on its own. This emerging "live bacterial therapy" approach is an exciting application of synthetic biology—which takes advantage of tiny living organisms as factories for producing made-to-order biological medicines, fuels, fertilizers or any other useful compound. In this case, bacteria were designed to help patients who suffer from the genetic heritable disease, phenylketonuria. These patients are missing an enzyme needed to break down the amino acid phenylalanine. Phenylketonuria is a serious condition, requiring an extremely strict diet to prevent seizures and severe mental disorders stemming from phenylalanine toxicity. In a proof-of-concept clinical study, researchers from Synlogix custom-engineered bacteria that manufacture the missing enzyme. Early results for patients that took the bacteria orally, like a probiotic, showed a significant reduction in blood phenylalanine, compared to patients that did not get the bacteria. This study provides promising evidence for the technology, not only for the treatment of phenylketonuria, but for addressing a range of previously hard-to-treat disorders.

## The ethics of autonomous vehicles may be more complex than expected



A recent study published in the journal Nature, reveals people's diverse and often paradoxical ethical perspectives when it comes to driverless cars and decision making behind the wheel. From previous research, ethicists already knew that moral dissonance is at play when it comes to driverless technology. For instance, previous surveys found that people believe that

autonomous vehicles should spare pedestrians at the risk of passengers when a crash is inevitable, but those same people report that they would not purchase vehicles that are programmed with that behaviour. Interested in uncovering further possible ethical conundrums for self-driving car makers, the researchers designed the 'Moral Machine', a survey of 2.3 million people from around the world that challenged respondents with 13 questions involving an inevitable death scenario. The researchers identified three general groupings of countries or territories based on their moral attitude, and interestingly found that these groupings correlated with distinct cultural-religious, political, and economic factors. For instance, respondents from countries with significant economic disparity tended to choose to spare pedestrians of higher socio-economic standing. In another example, respondents in countries with strong government institutions were more likely to spare law-abiders than pedestrians crossing the road illegally. This research is a reminder that in the development and honing of driverless cars, integrating the complex and diverse range of moral ethics may become an increasingly relevant technological challenge.