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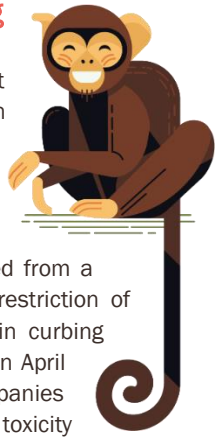
Life Altering Science

Summer/Fall 2018

Scientists coin the nature to nurture ratio when it comes to educational success

An international team of researchers have made headway in further elucidating the role of genes in educational success. From previous research, we already know of a number of SNPs that correlate with an individual's educational outcomes—but these findings have drawn from a limited sample base. This new study analyzed the genomes of over 1 million individuals of European descent (with the use of over 70 datasets from 23andme, the UK Biobank and other sources) and identified numerous new SNPs linked to educational attainment, most of which were located in genes regulating neurotransmitter secretion, ion channel activation, and synaptic plasticity. The team also developed a novel predictive scoring system that was able to account for 11% of the variance in educational success between individuals based on the variations within these SNPs—the rest appears to rest on nurture. For instance, in examining a cohort of 22,135 sibling pairs, the scientists show that characteristics of the environment in which a child is raised can be used to enhance educational attainment predictions, and other recent work suggests that parental alleles (not present in the child) can also sway success at school.

Artificial intelligence is getting closer to replacing animal testing



US toxicologists have developed a new artificial intelligence system that can predict the toxicity of chemicals in live organisms. Although computer models have been used for decades to predict the safety of chemicals destined for human use, regulatory bodies have traditionally demanded more accurate animal testing for approval. With this new AI tool, scientists are getting closer to reaching the same predictive accuracy as one would expect with *in vivo* experimentation. The tool was developed with data from 10,000 chemicals and 800,000 animal tests accessed from a publicly-available resource (REACH - registration, evaluation, authorization and restriction of chemicals). As chemical safety agencies are becoming increasingly interested in curbing animal testing, advancements in these new in silico tools are particularly timely. In April 2018, a group representing 16 US government agencies invited academics and companies to the NIH to produce a computational model that can perform as well as animal toxicity testing. The model will be made available for free download later this year.

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Novel theory about the cause of Huntington's Disease

Researchers at McMaster University have developed a new theory about the cause of Huntington's Disease (HD)—opening the possibility for new treatments to curb this devastating terminal illness. HD is a hereditary neurodegenerative disorder that results in impaired cognition, uncontrolled movements and emotional problems. It is caused by mutations in the HTT gene that encodes the huntingtin protein. Mutant huntingtin protein aggregates in the brains of Huntington's patients and these deposits or inclusion bodies have been long thought to drive the pathology of Huntington's disease. This new study challenges the traditional protein misfolding/brain deposit theory of HD pathology, concluding that inclusion bodies are more likely a result of the disease, rather than its cause.

Houseplants of the future could warn humans of impending danger

Experts in plant molecular genetics and architectural design have come together to devise a new role for common houseplants – home health monitoring. In a recent perspective piece in *Science,* researchers from the University of Tennessee discuss the addition of chemical sensing-and-reporting capabilities to the aesthetic benefits that house plants already provide. The authors postulate that plants are an ideal biological sensor, harbouring a wide repertoire of responses that can be modified and customized using synthetic biology. Indeed, several crop and environmental "phytosensors" have already been designed in this way: for instance, tobacco plants have been engineered to sense and report (through production of fluorescent proteins) bacterial plant pathogens. It is thought that similarly-modified houseplants could visibly warn residents of harmful microbes and compounds, such as mold species that produce volatile organic compounds (VOCs) and viruses. The required synthetic biology and phytosensor technologies are available but have never been applied to houseplant species, and tools for engineering popular houseplants are lacking. However, scientists are already beginning this work in model laboratory plants and planning to experiment with houseplants in the near future.