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Project #1: An artificial life environment in which to study the role of consciousness in the physical world

von Neumann, Wigner, and Josephson have suggested that consciousness interacts with the physical world at the level of quantum mechanical events. Amazingly, decades of work at Princeton and other groups have shown that the intention of living systems can alter truly random (quantum) events. For example, a quantum random number generator that is calibrated to give equal numbers of 0 and 1 bits, if connected to a light which provides warmth for chicks or rats when a "1" comes up, ends up giving more "1" bits than it should (statistically to a highly-significant level). This has been replicated with thousands of normal human subjects and a variety of animal species. Thus, the invested intention of living systems can apparently couple to, and influence, "random" quantum events.

But what is "intention"? In this project, we will experimentally test the main claim of the Functionalist school of cognitive science and AI: the idea that intention and consciousness is only a function of information processing modules. Does physical instantiation of a cognitive system (a real animal) matter for this mind-quantum interaction? Or, can an artificial system that has "intention" and "desires" exhibit the same effect?

The project involves using one of the many available platforms for artificial life experiments to set up a virtual population of creatures that compete for resources. Their interactions (who is successful and who dies) is normally driven by random number generators (RNGs). One (or a few) of the virtual individuals in this population however will have access to the output of a real quantum RNG (it's a USB device). The question we will answer is: if a virtual organism has the "desire" for more "1" bits out of a quantum RNG, does this actually change the statistical distribution of the output of the RNG in the way that a real organism would? We will also experiment with a genetic element to this system, allowing the creatures to multiply and exerting a selection pressure (genetic programming). We will then ask if the gene for using a true RNG spreads through the population (as it should, if its manipulation confers a survival advantage on the virtual creatures). If the answer is yes, this will reveal a fascinating and fundamental property of the physical world and shed light on the nature of "mind". If the answer is no, it will be experimental data arguing against the validity of functionalism as an approach to understanding cognition.

This is an interesting and very unusual project with wide implications in several areas. I look forward to hearing from any students interested in philosophy of mind and artificial intelligence, cognitive science, or artificial life. Please contact me at michael.levin@tufts.edu and see my lab at <http://www.drmmichaellevin.org>