

# A Mathematical Model of Free Will

Alex Hankey

SVYASA, Eknath Bhavan, 19 Gavipuram Circle  
Bangalore 560019, Karnataka, India  
alexhankey@gmail.com

**Abstract.** Previously it has generally been considered impossible to develop a mathematical model of how a mind that is of a different nature from matter can influence the material world. However, a new model of how the physiology can embody states of experience, i.e. cognitive states that include self-awareness, also makes possible the modelling of how the mind can create influences in the observable universe, providing that the observable, macroscopic universe is modeled and its dependence on a quantum microscopic world is modeled in a particular way. This presentation therefore consists of two parts: first a precise description of a macroscopic world into which information can be injected from a microscopic level that alters the future course of macroscopic events; and second a description of processes in the new mathematical model of mind and its embodiment in neuronal processes can result in quantum information being injected into the universe from a microscopic, mental level. The key to establishing that we do in fact live in the right kind of universe in a solution to the long-standing and contentious problem of the ability of water to retain information. This is possible because the number of possible water clusters in a given volume of water is far higher than than the number allowed by entropy density, at any rate up to a certain temperature limit. This means that, below such a limit, the allowable water entropy density is reached long before the total number of possible configurations has been explored. This allows a certain kind of information, that I have proposed to name, "Quantum Fisher Information", to be defined in the water. The main limiting factor is that any increase in information in a closed system such as a body of water at constant temperature, must be accompanied by an corresponding increase in entropy, and since the entropy is 'saturated' the required increase in entropy is not possible. The existence of a definable 'Quantum Fisher Information' in water therefore depends on this novel phenomenon of 'Entropy Saturation'. The phenomenon of information retention in water thus establishes that we live in a universe where all events depend on wave-packet reduction processes that are accompanied by corresponding increases in entropy, as explained by myself in a previous Vigier Symposium. This insight thus defines the relationship between the microscopic quantum universe and the macroscopic world more precisely. In this kind of universe, quantum events do not result in a splitting of the universal wave-function. Rather they result in an actual choice among the future universes, the choice injecting the information into the universe required to define its future. The entire history of the universe is therefore constructed out of a series of such quantum information producing events, rather the way that David Deutsch has envisaged, but with the addition of entropy production that has to drive wave packet reduction processes. In such a universe, states at the 'Edge of Chaos' due to critical instabilities at the basis of the new theory of mind, are able to inject complex information structures into the universe. All biological organisms are based on regulation of the threefold systems processes, Input / Output, Turnover and Storage, each of which has to be regulated from a locus of control at criticality in order to maximize efficiency of regulation. Such a threefold, tri-critical, structure allows the modeling of states of mind in which three elements of cognition representing knower, process of knowing and known, are held together into a single entity, identified as the Self in the literature on the subject. Previously, the Self has been identified with the loop contained in the newly identified dual aspect information structure at criticality, represented by  $\langle \text{=====} \mathbf{O} \rangle$ , and definable on any network of neurons / cortex. Now however, a more complex structure involving multiple cortices is being proposed. Since each of the three states is at 'The Edge of Chaos', and since each state can be represented by one critical structure in a tri-critical state, it becomes possible for a state on a primary cortex to 'conceive and idea' represented on another cortex, and to convert this into a wave-packet reduction process which transmits information into the physical world, making an effective choice between possible futures of the universe. In this way, one can construct a genuine theory of the action of mind injecting information and making choices about the future universe that it wishes to inhabit. It is not a simple theory and not for the fainthearted!