“Conservation of Information in Proteins, Software, Music, Texts, the Universe and Chocolate boxes”

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Charles Darwin, jointly with Alfred Russell Wallace, introduced their theory of Natural Selection at the Linnean Society on 1st July 1858. Today, it defines evolutionary thought through and beyond the discovery of the double helix in 1953 and the development of modern genetics. However, there are features of life, for example the recently-discovered remarkable constancy of average protein length, the existence of surprisingly long proteins and why protein length distributions are identical to distributions of computer functions, which it does not explain. Some hints come from the physical sciences, thanks to a remarkable theorem by Emmy Noether in 1918, whereby for the first time we understood that the grand Conservation principles of the universe such as Conservation of Energy, Linear Momentum, Angular Momentum and so on, were actually the result of symmetries.

In this talk, using concepts from Information Theory, Statistical Mechanics and with the singular help of a box of chocolates, we will demonstrate that large assemblies of discrete pieces at any scale, be they proteins (made from amino acids), pieces of software (made from textual symbols), words in books, letters in words, the Bach chorales (made from musical notes) or the distribution of elements in the known universe, have important organising principles in common deriving from a previously unsuspected Conservation principle which controls these phenomena.

In short, all systems built from discrete pieces are guided by the Conservation of Hartley-Shannon Information, and a corresponding symmetry, scale. Finally, we will speculate on the incidence of post-translational modification of amino acids in proteins and wildly speculate on the nature of dark material in the universe before a grand finale where we reveal that Elvis is hiding in a yeast.

Dr. Les Hatton is Emeritus Professor of Forensic Software Engineering at Kingston University, London. Educated in mathematics at King’s College, Cambridge 1967-1970 and the University of Manchester where he received the degree of PhD in 1973 for his work on the dynamical structure of tornadoes, he was awarded the Conrad Schlumberger Award of the European Association of Geoscientists and Engineers in 1987 for his work as a geophysicist before becoming interested in software reliability and switching careers in the 1990s. As a jobbing mathematician, he has worked in all the usual areas, meteorology, geophysics, computer science, and various branches of theoretical physics.

He spends most of his working time these days in his garden shed, writing and wading through large amounts of data looking for interesting patterns. He gets out a bit, is quite reasonable at the English longbow, and has played guitar and harmonica in a blues band for 25 years.