

***A STORY OF NATURAL MOLECULAR EVOLUTION
FROM ATOMS AND WATER TO THE LIVING CELL*****J.C. Collins, PhD****Dedicated to the late Stanford University Professors: William S. Johnson and Carl Djerassi.**

Sixty years ago a little book appeared which helped change the course of biochemical history and, with recent discoveries, may help change it once again. In 1944, Erwin Schrodinger, one of the fathers of quantum mechanics, wrote in "What is Life?" that the genetic information for reproduction is within a molecule in the living cell.¹ Francis Crick, who collaborated with James Watson in the construction of the model of DNA, credits the book with giving him the idea that DNA might be the molecule.² In the book, Dr. Schrodinger also pointed out that liquid water, as the environment in which the development of natural molecules took place, reversed the Laws of Physics. Based on the Second Law of Thermodynamics, molecular systems should move spontaneously from order toward disorder but biomolecular development appears to have moved in the opposite direction - from extremely simple molecular forms, like formaldehyde and methane, to proteins and biomembranes, which are so complex and function with such incredible efficiency, that they may never be fully understood. However, recent studies have revealed that it was surface water which not only reversed thermodynamics in their development but provided spatial criteria for their selection as integral components of the living cell.

The purpose of the story which follows is to provide a pictorial view of how the unique properties of water might have been involved in producing the incredible phenomenon we know as "life." Of course, the probability that natural molecules could have formed spontaneously in a gaseous environment is close to zero.³ However, we now know that water molecules are held together on surfaces by two different types of hydrogen-bonding.⁴ Columbic attraction between charge-points on surfaces holds molecules and ions together at multiple angles and distances to provide for stability and mobility.⁵ However, hydrogen bonding is also "covalent."⁶ In ice, covalent bonds are stable but, when they form on non-hydrogen-bonding surfaces above 0°C, they produce relatively-ridged, but unstable, linear and hexagonal elements of hydration.^{7,8} By rapidly rotating from covalent bonding to higher energy point-charge bonding, individual water molecules absorb quantized units of energy from adjacent ordering surfaces and move molecules within those surfaces toward lower energy and higher order.^{9,10} Thus, surface water molecules, by moving spontaneously from order toward disorder, not only reversed thermodynamics as biomolecules first formed but provides for spontaneity and order within living cells today.¹¹

As you read what follows, you will be amazed how the unique bonding properties of atoms and water molecules set in motion the spontaneous formation and selection of the molecular components of life. In other words, the *omega* was defined by the *alpha* - if life should cease and the conditions which brought it forth are here once more, it will appear once more.