

## Statement of work (2007)

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There are two avenues of research that i find particularly intriguing in 2007. One has introduced a new paradigm to explain why Nature created Life and why Life needed a brain. The other one may have just proven that spacetime must have an atomic structure (just like matter has an atomic structure), a notion whose impact could be momentous. Last but not least, i am still trying to prove that Quantum Theory can be interpreted as the "ripples" that an observer causes as it moves in spacetime.

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### **Bio-energetics**

The 1990s have brought a wealth of experimental data on the structure and the processes of the brain. We now know that you do X or feel Y because some messages traveled from this part of the brain to that part of the brain. But it is like knowing that the car moves because the engine burns fuel, without knowing what caused the engine and the rest of the car to be built in the first place.

Bioenergetics is almost an alternative to Darwin in explaining where it all came from. There were several pioneers who emphasized that Life is about Energy. Eventually, a lot of Biologists started agreeing and started applying Thermodynamics (the discipline of Energy) to Biology. They soon realized that

The thermodynamics of Life is not traditional thermodynamics: it is non-equilibrium thermodynamics, because anything that is alive is not in equilibrium (you will reach a state of equilibrium only when you die). Thus Physicists and Mathematicians developed non-equilibrium thermodynamics, that happens to be based on non-linear equations (unlike classical Physics that is based on linear equations). The study of non-linear equations led to all the speculation on chaos, complexity, self-organization, etc. The result of all these speculations, calculations and simulations is that, to some extent, we don't need that much of Darwin's theory anymore: once life happened, it was bound to "evolve". Darwinian evolution (which, strictly speaking, is about natural selection applied to variation and yielding fitter and fitter individuals, certainly helped. But bioenergetics alone proves that, given life, it has to evolve.

That happened in the 1990s. More and more sophisticated theories of bioenergetics are beginning to approach the very form of life that we observe on Earth, and in particular the human brain.

Ronald Fox, for example, makes an important point. Biologists are agreed for a long time (see my chapter on Ecological Realism) that a living organism can survive only if it can make predictions. Fox shows that non-linear systems can only be predicted by simulating them faster than they move. There is no simple mathematical solution to the problem of predicting

what is going to happen next in a natural environment. There are just too many interacting factors. You need to simulate the environment and carry out the simulation very quickly.

Thus it is not a coincidence that Life evolved the nervous system, and in particular the brain: the brain can be viewed as a rapid simulator of non-linear systems. Your brain is capable of simulating what will happen next in the environment. For example, it can simulate the consequence of a movement, which in turn helps refine the movement as it happens.

Bioenergetics can explain very fundamental facts of our cognitive life based only on physical, chemical and mathematical laws.