

Physiology at the Centre of Understanding Life

We don't yet know how life first evolved, but we do know that its chemical processes needed to be constrained to enable self-maintained circuits to exist. Otherwise their components would rapidly disperse. That constraint required the evolution of membranes, endowing the earliest organisms with sensitivity to their environment.

The descendants of those earliest membranes now form the vast structural many-roomed mansions of modern eukaryotes, but they still control, even more so, where and how chemical processes are constrained. Even the TCA cycle requires the structural integrity of the mitochondrial membrane and its electric potential.

The logic of life (which is what "physiology" means) also lies in those membranes and their ON-OFF switches we call channels. The genome also contains ON-OFF switches, but these are controlled by the physiological networks on which epigenetic processes depend. There is no "program of life" in the genome. Those logic circuits lie in the membranes and their sensitivities to electrical and chemical changes.

Physiology must now come to the rescue of molecular and evolutionary biology. The 21st century will therefore see a move back to centre stage as biology moves on from simplistic gene-centric views to understand the complexity of living systems. To achieve that goal we will need the vast databases of genomics and proteomics, but we will also need new ways of understanding their interpretation.

Seize the day!