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The “thermodynamics of knowledge”, with ideas borrowed from Daniel Dennett

It occurs to me that a parallel can be drawn between the local and temporary lowering of entropy that life, as a self organizing (and energy consuming) process can accomplish, and the quite similar case for information. Information processed (or knowledge or even “truth” as philosophers might say) is also a local and temporary thermodynamic lowering of randomness or noise that life, through the mechanisms of both evolved behavior and accumulation of learned strategies (like the natural selection of traits that confer survival), can also accomplish. Of course there is nothing to say that non-organic life couldn’t, in principle, accomplish something quite similar.

Unless you are a creationist, you will understand that life is thermodynamically possible because the Earth is not a thermodynamically “closed” physical system. Increases in organization (for life, the accumulation of complex structural arrangements) is possible, albeit at the cost of consuming incoming energy and converting it to output heat. In the same way (unless you are a Platonist and believe that knowledge comes from God), increases in information (for life, the accumulation of genetic behavioral programming and/or anticipated or learned strategies) is possible, again at the expense of increasing the total overall entropic noise content of the universe.

Humans are, so far, at the top of the heap of “imformavores”- creatures that consume and process information and convert it to knowledge. At this point in evolutionary time, apparently partly just to further improve our ability to consume even more information. Originally, with living organisms, this process was driven by learned situation-response mechanisms. Eventually some animals evolved the trick of anticipating possible scenarios (eyes that scan for predators and brains that trigger evasive action) which could improve survival by avoiding danger. Most recently in evolutionary history, some primates evolved the ability to acquire improved strategies by reprogramming the hominid brain within a single generation. This is sometimes called learning. Learning is a new evolutionary trick that appears to have improved human survival rates dramatically, based on human population growth alone (probably due in large part to both irrigation and agriculture). In the last 2,000 years however, humans have ridden a wave of increases in knowledge (technology and medicine) that have created not only many more humans, but also many new uses for this additional understanding, and not always in our own evolutionary (primitive) interests- for example: birth control.

But the fact remains that, both increases in structural organization and increases in informational organization are intimately related in that both are local and temporary decreases in our molecular entropy (increased molecular organization). And of course, information, even as rudimentary as the molecular information in DNA, is essential to the organization of life as we know it.

That both evolutionary life and the accumulation of knowledge are bottom-up processes, blindly driven by replicating molecules at all levels of complexity and organization, explains the concept by Giulio Giorelli that “Yes, we have a soul. But it’s made of tiny robots.”