

## In the dynamic balance called the Earth, the double helix 100 years into the future.

The year 2050. Approximately 100 years will have passed since human beings came to know of their own genetic structure. The gene has existed as a beautifully twisting double helix. Scientists realized the meaning of this immediately. Double. Meaning duplication was possible. Each of the double chains was a mirror reflecting the other. If a double chain comes undone, and each makes an image based upon itself, the gene will duplicate. This is exactly the method by which life transmits information to offspring.

But what does the helix mean? While the DNA helix describes a spiral, its locus forms a bigger spiral, and that bigger spiral is collected in an even bigger spiral. It becomes a nest of super helix structures, as if thin woolen yarn is wound into a big ball. And that was the most effective method to unfold the chains of life, upon which were written vast amounts of information, into an extremely small cellular interior.

The year 2050. I actually believe that the life sciences are welcoming in a new phase. For the past 100 years, we have regarded life too much as only information. While DNA is surely an archive of genetic information, the nature of life is more a dynamic phenomenon than an archive. There are stimuli and responses, and rhythm and exchange. There are action and reaction, and reception and concatenation. Nevertheless, life keeps regular

balance, and constancy is maintained. In 2009, I published a book entitled "Dynamic Balance" that summarized this state of affairs. If life is defined as information, then life is a self-reproducing system. However, if life is defined as a phenomenon, life becomes a more fluid system. I refer this to as dynamic balance.

The core of the issue is working out the principle that supports that dynamic balance. There is an assumption I call the jigsaw puzzle model. Elements in a system maintaining dynamic balance are not built from parts that assume a function like mechanical components. Rather, they are put together like pieces in a jigsaw puzzle, so that elements that cannot assume a function on their own complement each other. The pieces are cells or more micro-level proteins. Therefore, even if one piece is thrown away, the surrounding pieces remember the shape of the lost one, and stipulate the shape for a new piece that fits. So even if the pieces keep updating one after the other, at the same time, the design of the whole jigsaw puzzle does not change that much, and that is what maintains the dynamic balance.

The year 2050. I hope that the mechanism of dynamic balance is revealed more precisely, vividly and clearly in a language with micro-resolution. Then perhaps we will have a new outlook on life in the dynamic balance called the Earth.

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