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## *Foreword*

When I was a student, I got on very well with my professor of genetics whom I greatly admired — an admiration which subsequently turned into affection. I had developed the habit of visiting him regularly in his office in the Institute of Molecular Biology on the Jussieu university campus (nowadays renamed as the Jacques Monod Institute). I believe he shared the pleasure I experienced from our discussions which often went beyond topics of biology.

This all took place towards the end of the '70s, in an ambience that is difficult to describe nowadays. I had started my career very badly (it has not really improved much since). After refusing a position as a lecturer and giving up my PhD thesis, I severed all links with the academic world. I lived by casual jobs, day to day. I had only a few friends, none of whom were biologists or scientists: they were mostly aspiring artists and we led a life without any clear direction, occupied by never-ending discussions and walks around the streets of Paris.

Jean Tavlitzki was the sole researcher with whom I had kept in contact. A few years earlier I had attended a course he gave which enthralled me. One of his lectures concerned cell differentiation and that was the origin of my infatuation with the subject.

I am mentioning this because the starting point of this book comes from one of our many discussions. At that time I still thought that the development of an embryo was directed by a genetic programme which functions due to specific proteins. One day, he pointed out to me that no such proteins had ever been discovered in organisms with several cells. I was more than somewhat

disturbed by this as their existence seemed so obvious to me that it could not be doubted.

Jean Tavlitzki had not said this to contest the predominant ideas of the time or to throw me off balance. It was simply an objective observation made with scientific precision. He did not imagine that in the future these regulators would not be discovered and went no further in drawing any kind of conclusion that could challenge genetics or molecular biology. His observation was of the greatest relevance because, as I shall explain in the following pages, these specific proteins have never been discovered and that produces a major contradiction in genetic determinism.

As for me, I went one step further and one thing led to another, ending in my formulating a new theory. During our conversations, I explained to him the main principles which I also described in the first article I had published at that time. Jean Tavlitzki could have prevented me from following this path. He had enough influence over me to do so and I think I would have listened to him if he had tried. He did not do so, however. He did not prevent me from thinking and I am deeply grateful to him for that.

Since this “germinal scene”, if I may call it that, I have traversed unforeseen fields such as the philosophy of biology, published several articles to complete my theory, and undertaken various research studies, to arrive now, at writing this book.

In it I explain the theory of cellular Darwinism, also called ontophylogenesis. It is the extension of natural selection, taking place inside the organism among the cell populations of which it is constituted. It ends with evolution and ontogenesis merging into a single phenomenon. Its application models help support it and show that it also emerges onto a concrete experimental research programme.

I have already formulated my theory in my earlier articles, but now I explain how this general theoretical context breaks with both genetic determinism and self-organisation, and how it goes beyond their contradictions. Indeed, since the publication of genome sequencing, many researchers, probably disappointed by its results,

are turning to theories of self-organisation, thinking they may find an alternative there to genetic determinism. I have therefore devoted long sections to analysing the foundations of holism and self-organisation in which I show that these theories are only superficially different from genetic determinism, and that they are not a valid alternative.

Finally the story speeds up. Many data published in the last ten years support ontophylogensis and give it a new dimension. The non-specificity of proteins is nowadays documented to the point where it has led to the foundations of molecular biology being challenged by molecular biologists themselves. Probabilistic gene expression has also become an unquestionable phenomenon. I have undertaken computer simulations which demonstrate the relevance of ontophylogensis, as well as analyses of its epistemological aspects. All these studies are new material that I have incorporated into this work.

This book therefore mainly concerns biology, but also touches on philosophy and history. Although not a book aimed at the general public, it is addressed to a broad audience extending beyond the circle of specialists. I have avoided terminology which is too technical as much as possible. I have not always avoided redundancy in my explanations where they help comprehension and I have frequently used explicit expressions even though they may make the style more ponderous. I have provided a glossary to help the non-specialist reader and invite him to refer to it as often as necessary. He might even do well to begin by glancing at it. As for the bibliography of the subjects tackled, it consists of a long list. I have more often than not contented myself with referring to the most significant examples or syntheses. Certain chapters also include many quotations. Looking back at these historical texts on which biology is founded is essential to escape from the confusion which reigns in current debates. Reading them requires a little extra effort on the part of the reader.