

PREFACE

This volume is the second part (B) of the two-volume work on Darwin's Pangenesis. Like part A, it also contains five chapters. Chapter 1 compares Darwin's contributions to genetics with Mendel's legacy, proposing that Darwin should have been regarded as one of the most important pioneers in genetics. Chapter 2 reviews Darwin's concept of graft hybridization and provides further evidence in support of it, emphasizing that Darwin's pangenetic explanation for the production of graft hybrids is consistent with the current understanding of the molecular mechanism—horizontal gene transfer. Chapter 3 focuses on Darwin's Pangenesis in relation to inherited diseases, cancer metastasis, regenerative medicine, transplantation, and organ transposition. It is proposed that the notion of Darwinian medicine should be expanded with inclusion of Darwin's Pangenesis. Chapter 4 focuses on Darwin's Pangenesis in relation to xenia, telegony, reversion, bud variation, and the inheritance and non-inheritance of mutilation. Chapter 5 compares Darwinism with Lamarckism, neo-Darwinism (including the Modern Synthesis), and Lysenkoism. The rediscovery of Darwin's Pangenesis sheds new light on Darwin's own synthesis: natural selection and Pangenesis. It is proposed that Darwinism throws more light on genetics and evolution than any other theories, and there is a need to go back to Darwinian Synthesis.

This two-volume work is not written by a professional historian but more from the position of an experimental researcher for whom it is important to fill the gap between historians and molecular biologists. Historians are more aware of the past but less aware of the present. Molecular biologists are more aware of the present and less aware of the past. For example, historians repeatedly described how Galton disproved Darwin's Pangenesis by his blood transfusion experiments, but they seem to be unaware of the new evidence for heritable changes induced by blood transfusion. Molecular biologists are familiar with circulating cell-free DNA, mobile RNAs, and extracellular vesicles, but they appear not to be aware of Darwin's so-called gemmules. This is probably one of the reasons why Darwin's Pangenesis has been ignored for such long period of time.

In the history of genetics, neglect of certain findings and theories is not uncommon. For example, both Mendel's laws of heredity and McClintock's

work on transposable elements had been overlooked for decades. In 1958, the centenary of the first presentation of Darwin's theory of evolution by natural selection, Michie proposed that the day of Pangenesis's return "has dawned." In 1968, the centenary of the publication of Darwin's Pangenesis, Towers made an interesting comment: "A temporarily-eclipsed hypothesis may find itself eventually rediscovered in a safe ecological niche, or even, as with those of Mendel, elevated to the heights. ... Perhaps it is only now, a century later, that it will be vindicated by the molecular biologists." Today, Darwin's assumption that invisible gemmules are the carriers of hereditary characters, they are thrown off from cells, and they diffuse from cell to cell and circulate through the body, has been removed from the position of a provisional hypothesis to that of a substantial theory. I believe that the rediscovery of Darwin's Pangenesis, if and when admitted, would, just as the rediscovery of Mendel's work, have a tremendous impact on genetics, evolution, agriculture, medicine, cell biology, and the history of science.

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YONGSHENG LIU