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The Biology and Genetics of Cells and Organisms

Protoplasm, simple or nucleated, is the formal basis of all life. Thus it becomes clear that all living powers are cognate, and that all living forms are fundamentally of one character. The researches of the chemists have revealed a no less striking uniformity of material composition in living matter.

Thomas Henry Huxley, evolutionary biologist, 1868

Anything found to be true of *E. coli* must also be true of elephants.

Jacques Monod, pioneer molecular biologist, 1954

The biological revolution of the twentieth century totally reshaped all fields of biomedical study, cancer research being only one of them. The fruits of this revolution were revelations of both the outlines and the minute details of genetics and heredity, of how cells grow and divide, how they assemble to form tissues, and how the tissues develop under the control of specific genes. Everything that follows in this text draws directly or indirectly on this new knowledge.

This revolution, which began in mid-century and was triggered by Watson and Crick's discovery of the DNA double helix, continues to this day. Indeed, we are still too close to this breakthrough to properly understand its true importance and its long-term ramifications. The discipline of molecular biology, which grew from this discovery, delivered solutions to the most profound problem of twentieth-century biology—how does the genetic constitution of a cell or organism determine its appearance and function?

Without this molecular foundation, modern cancer research, like many other biological disciplines, would have remained a descriptive science that cataloged diverse biological phenomena without being able to explain the mechanics of how they occur.

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- 1.1 Replication I
- 1.2 Replication II
- 1.3 Transcription
- 1.4 Translation