

Life Forms: Shaping Earth's Evolution

“How life has transformed our planet”

By

Nabil H. Swedan, Dott. Ing., P.E.

Pacific Engineering, PLLC

Summary

From the moment photosynthesis adapted to land, the transformation of our planet has followed an unstoppable course. As a living process, photosynthesis holds a natural power of multiplication, supporting an ever-growing diversity of life forms.

The inherent ability of life forms to reproduce, along with their cycles of birth, growth, and death, has continuously shaped the Earth's environment and climate. Life forms have become the independent variable in Earth's ecology, interacting with their inert surroundings and altering every part of the Earth's surface.

Each element of the Earth thus tells its own part of the evolutionary story, and together, these parts weave the complete narrative. The entire process of surface evolution is governed by natural laws. By studying Earth's history, we can better understand and predict both current and future environmental changes.

Life's inclusion in the equations of nature has made this understanding possible. This story draws on existing theoretical and scientific research work, supported by observable evidence. Surface evolution and climate change have been driven by the biological instincts of living entities to multiply, evolve, and adapt. However, no known physical laws can fully describe these fundamental biological factors, and thus science and philosophy converge in the evolution of nature—inseparable and intertwined.

Despite the long, gradual process of evolution, the core biological properties of life have remained unchanged over time, as though they are natural laws themselves. Consequently, the variability of Earth's environment may continue indefinitely, and the management of Earth's ecology should be a priority for human societies moving forward.

Contents

Preface	6
Prologue.....	8
Introduction	11
Chapter One.....	16
The Biosphere.....	16
Redefining the Biosphere	17
Energy Conservation for the Biosphere	19
The Role of Life Forms in the Biosphere	21
Philosophical Aspects of Biosphere Evolution	24
Chapter Two	28
From Basalt to Land Sediments	28
Basaltic Rocks	28
Sedimentary Rocks	30
Basalt Conversion to Sedimentary Rocks	31
Building the Landscape	34
Chapter Three	39
The Biosphere Chemical Reactor	39
Biological Sediments by Life Forms	41
Geochemical Process of Biological Sediments	43
Chapter Four	48
Photosynthesis	48
Photosynthesis Process	49
Photosynthesis Development and Expansion	54
Climate Regulation by Vegetation	57
The Everlasting Carbon Cycle.....	64
Chapter Five	71
Biological Energy Balance	71
Biological Energy Flow.....	74
Chapter Six	80
The Continental Land	80
Land Contribution to Surface Evolution	87
Chapter Seven.....	92
The Ocean.....	92
The Ocean Mixed Layer	92
Deep Ocean Temperature and Ocean Circulation	95
Sea Chemicals and Oceanic Basin Formation.....	98

Chapter Eight.....	105
The Atmosphere	105
The Early Atmosphere.....	105
Oxygen Generation.....	108
Evolution of the Atmosphere.....	111
Chapter Nine.....	121
Reflection on “Life Forms: Shaping	121
Earth’s Evolution”	121
Agreement with Reality.....	122
Philosophical Reflection.....	124
Chapter Ten	128
The Anthropocene Epoch/Noosphere.....	128
Factoring Humans’ Lifestyle and Per Capita Energy Consumption	131
Fossil Energy, Population Density, and Climate Extremes.....	134
Dimensions of Environmental Changes	137
After Fossil Fuels and Deforestation.....	140
Chapter Eleven	149
Concluding Paragraphs.....	149
Resources.....	154
Glossary.....	154
Symbols and Abbreviations.....	169
About the Author.....	174