

PROLOGUE

In the foreword to the Greek edition of the book "PANGAEA", Manolis Glezos, the National Resistance fighter (1940-1944), the leftist politician -not only in a Greek but in a European and global dimension- the first European resistance fighter, the environmentalist and "fanatic" amateur geologist, comments upon science and the scientific effort the following: *"In the roads of alluring visions, in the swirling maelstrom of imagination, at the point where the chimerical and the retrospective imagination slip into, in the broader range of assumptions, in the unlikely space of ectoplasms, the scientific researcher moves fumbling about and cautiously searching for the traces of all those uncountable efforts of the mind; he tries to recompose the wearisome course of the scientific research in order to find again his orientation, to retrace the route he will have to follow, to discover the structure and the essence, the movement and the behavior of the surroundings"*. With regard to the present book, Manolis Glezos identifies at first place his main orientation, namely the *"unity and totality of our world"*. He underlines that the present essay investigates *"the nature of the nature"*, the structure and the operation of Gaea (Earth), as from the fundamental views of the ancient Greek philosophers and the founders of the western contemporary science, up to nowadays' geological and biological scientific researches. Furthermore, he highlights the second significant message of the book: *"Life is a geological phenomenon"*, which is characterized by *"an excess beyond the linear single-dimensional view of a direction, in the concept of another beginning-less and endless dimension"*.

"The instant boundary of the planet's geological history is met at the point where the relatively new species, the thinking living being, the man, lives and tries to adapt him to. Man's history is short, however grandiose...Nevertheless, this thinking living being's impact on Earth is peculiar. Man does not see Gaea as his mother and acts against it as if he was a matricide, so Glezos. The man who is too arrogant and stuffy despises the earth and wants to subdue it". Whereas:

"First: He ignores the Gaea itself, he is unaware of its exact nature, history, course of evolution. The present book tries to answer all questions that are raised due to this unawareness.

Second: The man is not aware of the fact that he himself has also been created by nature, by planet Earth. In the book PAN-GAEA, there is detailed information on the conditions that allowed the birth of life on earth, the evolution of species,

the birth of the mammals, the primates, the human species Homo Erectus (Homo habilis, Homo ergaster), Homo sapiens.

Third: The man, although created by nature wants to subdue the nature, paying no regard to the subsequences that follow this arrogance of him. He scratches the Earth in order to erect houses. He flattens the Earth's geomorphologic relief in order to build cement towns. He scores the Earth's crust and caps it in order to construct motorways. He fills the waterways with debris and dams them, cements the bottom of the river beds, diverts the river stream flow and generates new floods. He opens quarries and mines and creates gaping wounds. He extracts water from the subsoil by drilling water wells and additionally causes static problems due to the faults on the Earth's crust.

He fells, destroys and burns the forests. In a thousand of ways, man intervenes on Earth, unfortunately, most of the times rapaciously".

"Man's impact on Earth varies and the consequences, which are either small or big, are not always negative. It is the first time in man's history that he goes so deep in the substance of the phenomena and possesses the ability to alter the bio-geologic world in a drastic manner. Technology, in man's hands, has today the power to alter, either slowly or fast, the human environments, the ecosystems, and the core of all living organisms' life including the man, by intervening in their genome. Unfortunately, man intervenes also in the most sensitive terrestrial systems, such as the atmosphere. Man who was an insignificant biological has now become a significant factor of the evolution itself; he participates in the evolution with his own activities. This fact constitutes a "double-edged knife" as it can prove to be disastrous for our species and drive also other species to extinction and at the same time, it can prove to be a significant and vital advantage for finding a way beyond today's deadlocks. That means, it can offer man the possibility to change his environment for his benefit, either by changing himself or both, i.e. to overcome the immense and disastrous climate changes, like a new ice age or a hotter period, a mortal solar storm, pandemics or a biologic disharmony, which would constrain him as species or even gradually drive him to extinction".

"Unfortunately, even if man does possess these abilities, he is unaware of the consequences of his possibilities. He has no consciousness of the special relations that exist between himself and nature. He is missing the necessary self-consciousness. He feels like being a visitor on planet Earth and behaves as if he was a host. He has no idea of what is being emphasized in this book: "Man plays now an important role in the evolution itself". He does not know that it is him who changes with his own activities the natural environment into an artificial

environment, the one he lives in today. While he plans his actions for the near future, he cannot imagine how the distant future would look like. In fact, while his imagination has unlimited possibilities, he has become short-sighted and blind. The most open-minded living being is behaving as the most narrow-minded one”.

“All living beings are adapted to their environment. The ones which do not succeed in doing so go extinct. Many of the animals’ and plants’ world species, which emerged once on the bio-planet Earth are neither identical nor do they have the same shape with the ones existing today. They have been transformed, evolved or have gone extinct. On the other hand, the human species changes with its own activities its environment and causes tens of species of the animals’ and plants’ world to go extinct every year”.

In fact, man has not understood the geo-systems and the Earth’s operations as a whole till today; we are only in the beginning with their interpretation. “Man has no self-consciousness, as far as his relations to nature are concerned. He wants to subdue the nature and become its master; he does not want to cooperate with nature as a creature of it. Man is totally unaware of the disastrous consequences of his attitude towards the nature”.

The beloved Manolis Glezos ends his prologue with his youthful thought summarizing as follows: “This book is a fascinating bio-geologic route on planet Earth; a history about man’s perception of Gaea, which starts in the mythic ages and reaches up to the present day; a study about what the scientific research has managed to discover about planet Earth so far. Finally, this is a set of crucial problems, which have to do with the future of planet Earth and man’s relations to Earth from different points of view, i.e.:

“The big Geospheres or else the operative systems which make up the mega-system Earth are its core, the mantle, the crust, the biosphere, the atmosphere and the magnetosphere. All these are in constant motion and in interaction one with another. Nevertheless, their mobility varies. The time of movements of the core, the mantle, the crust, the biosphere, the atmosphere and the magnetosphere are different one from another”.

Earth is a living planet, where the “inorganic” and “organic” forms and processes are unified in an integral unity. The bio-geo-environment is indiscrete. The life itself, as a geological process, has given birth to the biosphere (bacteria, algae, foraminifera, diatoms, porphyrins, plants-the converters of matter-ammonites, reptiles, mammals and the man). The man is a creature of the bio-planet Earth and while playing an important role in the evolution of the geo-bio-planetary

procedure, it participates in the evolution of the Earth. Man, with the technology he has developed today, plays an important role in the evolution itself and has therefore the ability now to change drastically the environment for his benefit. However, at the same time, he drives part of it to extinction. What is the borderline of this extinction?

Man is not yet aware of his relations to nature; not even of the consequences that are caused by these relations and by his and the Earth's evolution.

The constant search for an interpretation of the Earth, the universe and their phenomena leads to the conclusion that the thinking biological being failed in discovering either a vestige of a beginning or a prospect of an end in this process. The contribution of the present scientific project in understanding all relevant problems as well as the attempt to investigate the dimension of the concepts of the beginning-less and endless space-time is very important, so Manolis.

The seismologist Dr. Gerasimos Papadopoulos proposes a different title for the book: "Planet Earth, the Revolutionary Planet". He emphasizes the word "revolutionary", as the object of the book is indeed the history of the Earth's evolution; a history which is marked by continuous changes and reversals. Some of these changes are so small in quantity and imperceptible in quality that would never be able to be traced without scientific research. Indeed, the science finds and proves that nothing is today exactly as it was yesterday, even if this can not easily be anticipated by our sensory organs.

But, are the changes of the Earth always abrupt? Are all of them caused by sudden natural phenomena, like the earthquakes, the volcanic eruptions, the big typhoons, the extinctions of species, the draughts? Don't the small changes that occur every day and continuously contribute much more drastically to the alteration of the Earth's shape than it seems at first sight? Doesn't the lack of acquaintance with the concept of geological time and space hinder the experts from identifying how important the additive result of the small changes that happen every day is? Aren't the enormous changes detected by the geologists on the Earth's crust and by the biologists in the animal species the final result of many and continuous small changes that we can not anticipate?

Are the geological processes that take place on planet Earth related to the emergence, the evolution and the variety of life as we know it today? If the answer is yes, can we talk about geo-biologic phenomena? The contemporary science's answer on these basic questions is absolutely positive.

In this book, so G. Papadopoulos, the author does not present an additional geology manual, an academic geology book. As a geologist with a wide knowledge of the Earth's phenomena, underlines Gerasimos, the author is properly putting emphasis on the diachronic change of our planet through interrelated geological and biological processes. He is interested in motivating the reader and drawing his attention to the dynamic and ceaseless character of these changes. Furthermore, he emphasizes that these changes take place on all scales of time and space. He succeeds in falsifying the established view that the planet is changing only due to sudden and large-scale phenomena. In a simple, though insisting way, he shows that the additive results of the imperceptible changes that happen every day produces colossal changes in the depth of time. This book is classified in a rare and difficult type of bibliography. This is because it does not focus on the academic description of the object it is dealing with, but it rather drives the reader behind the phenomena's showcase and unveils the "secret chain of meanings" with an attitude that is based on the principles of the science's philosophy. This is the reason why this book appeals even to the non expert reader, the one who is thirsty not for the first, "typical" reading of the outer view of things, but for the second one, the deeper reading, which brings one close to the nature's "hidden" secrets. These secretes are never taught through the typical school lessons' process".

My dear colleagues aptly highlight the central idea of the book by reading its manuscripts. Nevertheless, one problem remained unsolved throughout the writing of the book: the appropriate title.

In the attempt to find a representative title for the book, which would reflect the views expressed in its pages, that is, the holistic view of the Earth's structure and operation, the Homeric word "Ichor" seemed in the beginning to be the most appropriate one. "Ichor" means the blood of the Gods but also the hydrothermal fluids of the rocks. Most of the scientific titles, like "*Biogeology*", "*Terrestrial Systems*" or "*The self-organized and self-regulating system of the Earth*" were soon rejected. Soon were also rejected some popularized titles like "*Earth's Messages*", "*Reading the Rocks and Waters*", "*Earth's Memories*", "*Our Eco-planet*", "*The Earth's biography*", "*The Earth, a living organism*" a.o.

The word "Pangaia" or "Pangaea" is a geology term that was originally used by the Austrian meteorologist and geophysicist Alfred Wegener in 1915 in his work "The origin of the Continents and the Oceans". The word is still being used today in the frame of "The theory of the Tectonic Plates" and it means the indiscrete big continent, the indiscrete land of the Mesozoic age, before its dismemberment into the different continents as we know them today. This palaeogeographic term is very important for the understanding of the Earth's crust's structure and

evolution, the birth of the oceans, the changes of the palaeoclimate and its inevitably immense impact on the evolution of life on Earth. With this broader meaning and the even more substantial concept of the holistic view of our geosystem's operations, from the innermost core to the uppermost atmosphere, the term "Pangaea" (Pan+Gaea) is used here like the equivalent word "Symban" (Syn+Pan, which is the Greek word for the "universe") for our whole world: the Greek word "pan" means the total, the unity, that is, all the processes of the Gaea (Earth), the unifying view about this spherical complex we name "the Earth".

The geosciences play an important role in the historical formation of human thought. However, we as society, have still no comprehension of this planet's operation and evolution processes, the planet we are born, we live, create and dy. People do not realize the size of the common geological processes' activity, because the whole history of humanity, in comparison with the exceptional length of the geological time, is only one moment.

Despite the big cognitive strides of the geoscientists, we do not possess even basic knowledge regarding the structure of the earth's crust, which lies only a few hundred meters or some kilometers under our feet. In every extreme but normal operation of our planet, like the earthquakes, the volcanic eruptions, the typhoons, the cold and the sweltering heats, we keep reacting in a primitive way and express ourselves with extremely anachronistic and stereotypical phrases: "disaster", "unprecedented phenomenon", "the weather went mad", "we are foundering", "the nature takes revenge", "the nature punishes us", "God is punishing" e.t.c. Furthermore, another big prejudice regarding the way our world operates dominates our thought, even the thought of some scientists: We believe that there are simple regularities, periodic and repeated phenomena all around this extremely complicated world. Based on the same phenomena, we try to forecast their reoccurrence either with scientific or non scientific methods.

Geology's significant contribution in understanding our planet's structure and operation lies in the investigation and classification of its "inorganic" components, i.e. the rocks and the minerals. Furthermore, in the understanding of life's evolution, as this has been imprinted on the geological strata in the form of fossils, not only during the over 3,5 billion years geological time, but also in the historical liveliness and evolution of the Earth's crust (tectonic-geodynamics). On top of all this accumulated knowledge was the consolidation Theory of Lithospheric Plates of Plate Tectonics, known also as Global Tectonics, and by extension, the understanding of many geological processes, especially the "violent" manifestations of our planet's liveliness, that is, the earthquakes and the volcanic eruptions.

We live in a peculiar age, where plenty of new scientific theories are formulated in the whole spectrum of the natural sciences and at the same time, some ideas of the past come to the foreground again. Some of them were hidden in the myth, others in the ancient Greek thought, in an embryonic form, others in the intellectuals of the Renaissance and the Enlightenment and finally others in the founders of the modern 18th and 19th century's science. The most important thing is that these ideas were propagated and the knowledge was diffused in the broader public through authoritative, popularized, scientific books. These endeavors resulted from the scientists' need and wish to share their knowledge with other people. "*When I deal with natural philosophy, I prefer to be outspoken on the things that benefit people...*" writes the great and ignored philosopher of the end of the classic years, Epicure. "*No one can get rid of his fears...when he doesn't know the nature of the universe and pays attention only to the myths...No one can enjoy the pleasures of life in their entirety without the natural science...*", aptly adds the misconceived intellectual of the ancient years. Science and everyday life cannot and should not be separated one from another. We should not entrench ourselves behind the allegation that science is inexplicit.

A scientist is supposed to have an overall and deep knowledge of all subjects of his scientific field but also broader knowledge. Furthermore, he should have excellent writing skills. This is though not always the case, especially when one tries to spread himself on many subjects beyond his narrow field of specialization and to approach the cohesive and spherical knowledge. The success of such a way of writing is not always guaranteed.

In its narrow and restricted limits, the present piece of writing constitutes a minimum effort, a shred of knowledge and questioning about understanding our natural world, especially the terrestrial system, based on today's level of geosciences. It attempts to convey a positive message about Earth and Life, which is born and transferred on it, in contrast to many other articles, books and reportages which keep seeing the evolution of our planet, the climate and life itself, especially that of the human race, from a negative and pessimistic point of view. The so called new-catastrophism, which is met not only in the scientific field but also in the social views, gains ground, terrifies and charms the people through its terror.

The aim of this book is neither to present the history and the development of geology, nor to become an introductory manual in the field of geosciences. It is rather an attempt to point out and to summarize some important, even radical discoveries and theories of geology, which contributed significantly to the development of human thought and constitute today a different point of view about our planet's operation. This view seems to be closer to the protohellenic

approach about Gaea, in the broader sense of the myth. It is a pure scientific distillate which may drug the human curiosity with the acquaintance with the natural world and attempts to answer, with a dose of reserved optimism, to the basic philosophical questions that are raised, either or lie latent within all of us. It attempts to describe those processes of our planet that keep it "alive" and to convey a different message for the whole terrestrial ecosystem in a comprehensive language and without diverging from the scientific frame.

No matter how simple, indifferent or good a book may be, it conveys information, knowledge, views and messages. It includes the knowledge, the opinion and the emotions of the author. Anyone who has the ability to express in writing his cerebral world could become an author when he wants to send his message beyond the narrow circle of his personal friends, where all of us use to express ourselves orally. Furthermore, one can easily become a writer when he wants to send his thoughts through a written text to the future generations and to talk even to people who are not born yet. Maxim Gorky, the committed author of sensitivity highlights in one of his texts that the book is perhaps the most complicated and the greatest among the miracles that man created on his way to conquer the future and to win his happiness-in the Epicurean sense-.

If we paraphrase the logo of the publisher North Carolina Press "Without books history is silent", we might probably claim that without books not only history would be silent but the whole world would be silent and blind. Today, the reader is seeking in the book the direct mental pleasure through stories and modern aspects of the myth and has also the need to be informed about and to get acquainted with what happens around him, the past, and the present day's achievements, the explanations of the natural and social phenomena. He is also fascinated with the prospects of the future.

Planet Earth and life, which comes out of it and depends on it, are as stable as fragile. Planet Earth's "survival" depends on many factors. One new bio-geologic factor is the man himself with his variable activities. Man is though a new species in Earth's history, who strives to adapt himself to the Earth's natural environment, where he lives and grows. He tries to understand his environment and at the same time, to change it and to gain control over it. As a species and as a society, man keeps still a distance from the symbiotic balance with his environment.

In the manifold world we live in, we, humans, count among many other factors that play a significant role in world's shaping. Nature, our "mother Earth", "is much more intelligent and experienced" than we arrogantly believe. Nature has the wisdom and the mechanisms to bring back to balance not only us but also the natural environment, which is disturbed due to man's impact on it. The only

thing is that nature works on this at a very slow pace, actually, at the pace of the long geological time. While we run our competitive race at a furious speed, no matter how far we go, Earth “has” its way to expel us as Medea (killing mother) in order to bring the whole life to balance, as well as to protect us (as affectionate mother), because we are actually its children. But, what do we know about the Earth’s structure and the changes that happen on it? To what extent do we understand the operations of its various systems? Which are their changes and interactions?

The 21st century, which is the continuation of two further very significant centuries in terms of scientific knowledge explosion and radical societal changes, namely the 19th and the 20th century, has to deal with challenges of planetary dimensions regarding our eco-planet as a whole. For some scientists, these challenges are related to Nature, for others to the man and his activities, actually, to the man-nature interaction. Man’s impact on Earth is a continuous, crucial process which grows in geometrical progression. Nature, with Earth and Life constituting part of it, is one of the most complicated systems we know. Any intervention in this extremely complicated and fragile terrestrial system requires good knowledge of all its functions, including its subsystems. Our today’s level of knowledge seems very impressive compared to that of the past; it is satisfactory for the kind of interventions man attempts to do today; however, it remains incompetent for the challenges that we expect to experience in the future. The future is neither to optimistic nor to pessimistic. The 21st century will evaluate all thrilling achievements made by the sciences and all their specializations. Furthermore, the 21st century is obliged to understand and develop the holistic view for our Planet and Nature in general. Whatever new could possibly arise from the thinking biological being as a result of the continuous evolution is beyond our imagination!