The Cosmic Life Instinct Points the Way to a Healthy Ecological Civilization

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Abstract Ervin Bauer formulated the most promising version of general theoretical biology in a mathematical form. He derived all the basic biological equations from a single fundamental principle, which is known as the Bauer principle. As this principle tells us, living organisms actively and continuously mobilize their free energy content to maximize their distance from lethal thermodynamic equilibrium. Although, for historical reasons, very few people know this principle, and even fewer recognize its power that originates from the fact that it transcends the framework of physics, this universal life principle represents a significant advance in our understanding of the structure and nature of the Universe, even more than the Copernican turn. This comprehensively life-centered worldview unites our physical, emotional, and intellectual aspects. It is also comprehensive in unifying individual, communal, and cosmic life. It offers an unexpectedly profound scientific basis for a cosmic ecology respecting all life forms, including the Living Universe. It offers new perspectives for our conduct of individual life as well as for good government and developing a healthy civilization.

Keywords Scientific method and explanation · First principles · Principle of least action · Principle of greatest action · Principle of life · Worldview shift · Healthy civilization

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Introduction and Brief Overview

> There is one natural law for all of us to live by, and that is caring and sharing and
>
> being responsible for the wellbeing of all other living things…
>
> Having a good relationship with all life is the key to
>
> physical, mental, social, and spiritual harmony.
>
> This is the way it was meant to be.
>
> Tjilpi Bob Randall, Anangu leader

The most effective elements of science are the *most general laws* of Nature. The discovery of the *physical laws* was an event of unique importance in the history of humankind which set the modern scientific revolution in motion and enabled Western civilization to dominate the world. I will present a series of arguments to consider, indicating that from time immemorial, human cognition has necessarily been directed toward the exploration of natural laws and the even deeper explanatory *principles* behind them. This is extremely important for us because the last century has seen the emergence of new disciplines investigating the relationship between life and the Universe, the consensus of which has led to the realization that we live in a Living Universe. In this context, I introduce here an unexpectedly profound theoretical biology that arrived at a mathematical formulation of a *universal biological principle* and the derivation of all the biological laws of Nature from it (Bauer 1967). Remarkably, this biological principle explains the convergence of results in these new disciplines (Grandpierre 2021a, b). The multifaceted agreement scientifically refutes the basic assumption of the physicalist worldview, making the qualitative transformation of the scientific worldview inevitable. Changing the dominant worldview transforms the type of civilization entirely. Ervin Bauer's theoretical biology is the foundation for a scientific and historical turn that is more profound than the Copernican one. While the first scientific revolution turned civilization toward a matter-principled, substance-based, individualistic way of thinking, the second, biological revolution will turn history toward a life-principled, principle-based, community-affirming one.

The Aim of Universal Human Cognition is to Understand Nature as a Whole on the Basis of Explanatory Principles

Strangely, in recent centuries the extreme importance of the fundamental role of first principles in science became obscured; and we lost the understanding that such principles were known before the first civilizations known today.

Furthermore, it is not sufficiently well acknowledged that in ancient Mesopotamia, even before the Greeks, a formulation of the three principles of the Universe and their unity, the cosmic Trinity, was recognized. "[T]he first unique principle from

which all the other gods took their origin, was […] the One and Good […] the first person of the supreme trinity […] the primordial principle" (Lenormant 1999, 113–114; referring to texts on cuneiform tablets from Ashurbanipal's library at the royal palace at Nineveh from before 625 BCE; please note that Thales, the so-called first philosopher, was born around 620 BCE). Neither Thales nor the later Greek philosophers knew what these principles were, but they knew that to know them was to know *the essence of the Universe*, and therefore their activity was directed to the discovery of these *arkhai* (ἀρχαί).

The Role of the Soul, the Intellect, and the Life Instinct in Our Decisions

There are timeless facts of knowledge. It is such a timeless fact that life requires action, action requires decision, and adequate decision requires reason. *The property of life that drives us, from within, to act, can be called the life instinct. The aim appropriate for life is provided by the life instinct, the possibility of realizing that aim is provided by the world. If the world is that 'what is,' then it is the life instinct that tells us 'what should be.' The basic task of all living beings is to make choices appropriate to life and the world. The life instinct is conceived by the soul, the world by the mind.* To be able to interpret and evaluate the feelings conceived by the soul and the data conceived by the senses in accordance with the life instinct, man needs a uniform basis of reference. Naturally, this reference basis is the life instinct. For a realistic perception of the life instinct, a pure soul is necessary. A realistic perception of the external world, adequate for the aims provided by the life instinct, requires a pure intellect.

The human intellect is able to take the mentally created image of the life instinct and the mentally created image of the world as a reference point instead of the life instinct and the world themselves. If neither the soul nor the intellect provides a true image of the life instinct and the world, then our conscious decisions and actions do not correspond to Reality.

The Central Role of the Most General Laws of Nature in Understanding Reality

For man to be both a living being and an intelligent being, we need a thorough understanding of life and Nature that is comprehensible and applicable to our everyday lives. The basic task of the human intellect is to understand the interconnections in life and the world. Since time immemorial, man's task in life has been to perceive and faithfully reflect the predictable changes in the external and internal environment. Changes in natural phenomena are governed by the laws of Nature. Natural

laws permeate everything that exists, are everywhere and at all times, and fundamentally determine the course of phenomena. To shape life in a way that is in keeping with the instinct of life, it is necessary to be aware of these rule-governed changes, because they help us predict the course of phenomena and thus shape our actions in a conscious and purposeful way. Ancient man, by his very nature, was deeply dependent on the knowledge of the laws of Nature, and thus strove to recognize, understand, and to explain these laws.

The Explanatory Chain of Nature is Based on Fundamental Principles

It is also a timeless fact that it is in the nature of explanation to explain the much by the little. The better an explanation, the more it explains with the less. *The best explanatory system is the one that also explains the natural laws of observable phenomena, and does so with a single, most general, and deepest natural law. These deepest laws of Nature, which together can provide a single, comprehensive explanation of the whole of Nature and all its fundamental aspects, are called first or fundamental principles.* It is only by understanding all the first principles together and how these principles form a unified whole that we come to understand Nature as a whole. Therein lies the basic task of human life. Incredible as it may seem in today's world, understanding the explanatory chain of Nature as a whole has always been, as it is today, the most fundamental task of human life.

Let's illustrate this with an example. The Hungarian biologist, ethologist, and evolutionary theorist Vilmos Csányi pointed out that the basic function of the nervous system is to coordinate the connections between perception and motor functions and to make the decisions necessary for life. The neural network maps and models changes in the external environment. The operation of the model enables the animal to anticipate predictable changes in the environment that are important to it and to make behavioral decisions based on these anticipations (Csányi 1994, 134). More closely, the basic task of the nervous system is to make 'good' decisions, decisions that are necessary for a life that are in satisfactory harmony with the life instinct. 'Good' decisions are born from 'good' feelings. A decision and feeling are 'good' when they correspond to the life instinct, and the better they correspond, the better the decision is and the better it feels.

In Ancient Nature Religion, the Natural Order is Based on the Life Principle

Naturally, the instinct for life played a central role in the worldview of the ancient peoples. In ancient societies, religion of nature also professed that the whole of Nature

and every part of it is endowed with soul. Because the soul had been essentially the same as the instinct for life and the feelings that come from it, the oldest religion of humankind had been based on the realization that the instinct for life permeates all of Nature. Since the 19th century, this ancient and cosmic nature religion has also been referred to as the religion of the soul, and in the jargon of experts it is called animism. Beginning in ancient Eurasia, and in many other parts of the world, animism became a scientific theory in which the soul was identified with the life principle, which was conceived as the source of all fundamental laws of Nature and society. "In the traditional thinking of so-called archaic societies, an immanent power, a vital principle, an individualized dynamism, is usually recognized to exist not only in man but in certain other material and biological beings as well" (Riviere 1987, 426). In fact, even today there are indigenous peoples who base their worldview on the life principle and identify it with the life force (Patterson 1998). This ancient religion of nature stems from an attitude that is extremely sensitive to the mystery of life energy hidden in all beings. The ancient Japanese nature religion Shinto turns with the highest reverence toward this mysterious energy that also awakens astonishment and admiration. Shinto refers to the law of the natural order that permeates all of Nature, and if one understands this, one can learn from it the divine and human nature of life and also how to live our lives. The moral virtues of the natural order, according to Shinto, are honesty and purity, writes Bhikkhu Satori Bhante in his book about Shinto. And he adds that the guarantee of happiness is the purity of the heart (Bhante 1990). Since the instinct for life is conceived by the soul, a clear perception of the life instinct requires a pure soul, a pure heart.

The ancient aspiration of humankind to recognize the deepest law of Nature is also indicated by the fact that many indigenous peoples regarded the cosmic law as the basic law of society (Long 1987).[1] Indeed, they are either free to choose the laws of society or to conform to nature-given Reality. If social laws have no universal basis in Reality, then there is no reason to obey them. Moreover, the fact that humans are potentially living and intelligent beings is a natural fact; since society is based upon humans, it should be based on this fact. Humankind, as natural beings, is under the control of the laws operating in the causal system of Nature. And if we want to bring society into harmony with the nature of humankind, it must conform to the universal laws of Nature. Ancient peoples shaped their lives, societies, and ways of life in the spirit of this recognition. Sturm holds the view that, in its broadest sense, the law of Nature is the rule that governs action and is derived from the essential properties of Reality. From ancient cultures to the present day, man has turned again and again to the law of Nature for measure, direction, purpose. Knowledge of natural law enables us to be true to our true being (1987, 318). In his book *The Origin of Things*, Julius Lips writes:

> The world of primitive peoples is based on the belief: "In the beginning was the power." This wonderful power is omnipresent, and its existence is as certain as the hardness of stone and the wetness of water, as all-pervading as the ether in modern physics. This power, supernatural only to modern man, but completely real and natural to the primitives, is known to them by many different names. To the Malayo-Polynesians it is mana, among the Iroquois Indians it is orenda, among the Sioux, wakan, among the Algonquians, manitou. To recognize the

> workings of this power [the vital power], to have part in it, to use it, and to master it—these are the aims of primitive man. In his world there are no coincidences—everything has its causes and associations; to discover these is the task of man. In the minds of primitive men, cause and effect are not restricted to the small domain of the physical world [in contrast to the modern Western mindset], but they are associated with the powers and phenomena beyond the visible world. There is a constant tendency among the natural peoples to recognize the manifestations of this [invisible] force. (Lips 1962, 312, tr. and insertions in brackets AG)

It is noteworthy that indigenous communities, such as the Maori people of New Zealand, knew the life principle and based their long-term sustainable society on it, developing their environmental philosophy upon their philosophy of life (Patterson 1998). According to the Maori,

> we should respect the natural world because each creature has a mauri or life force, and that this life force joins all beings—humans, gods, plants and animals, mountains and rivers and seas—into one interdependent whole, each part depending for its well-being upon the health of each other part and of the whole itself. (Patterson 1998, 70)
>
> It seems more evident to us as the century draws to a close that people from the traditional cultures of the East, of Africa, of North-America and of Australia have developed and preserved attitudes towards the natural world from which we have much to learn. What is common to them is a feeling for the affinity between the human and the natural world, and a sense that all things belong together and work together like the organs of a living thing. Animism, the belief that nature is activated by spiritual forces, is ancient and widespread, and can be seen in the sacred writings of the Hindus as well as in the oral traditions of the North American Indians. (Clarke 1993, 17)

All this suggests that the constant endeavor of primitive peoples has been to recognize the causal system of the invisible life force in addition to that of the material forces. There are indications that ancient humankind succeeded in this endeavor and developed a broader vision and a deeper explanatory world-view than the materialistic view that prevails today. Indeed, in the modern world, we know more and more about the details and less and less about the most important thing to know, that is, about the whole of life and the world. The current prevailing view in Western philosophy is expressed by "the doctrine [which] tells [us] that all there is to the world is a vast mosaic of local matters of particular fact, just one little thing and then another" (Lewis 1986, ix, insertions in brackets AG). Comparing this picture with that of indigenous peoples, we can conclude that the scope of their worldview exceeds that of the modern one.[2]

The Main Path of Science and Philosophy Has Been Directed, for Millennia, to Discover the Fundamental Principles of the Universe

The Highest Goal of Science and Philosophy is to Know the Whole of Nature and to Explain it by Fundamental Principles

It is also a timeless fact that there are two "directions" to be taken in exploring the explanatory system of the world. First, one can start from observable phenomena and then investigate further to find the laws of Nature, and deeper still, until all the fundamental principles are found. This opens the way to the second direction, which is to apply these principles and laws to concrete cases.

A solid foundation for our explanatory system is vital, because it determines how good our lives will be. We need a coherent system of the best-established, most reliable knowledge. The importance of such a reliable system of knowledge is so paramount that it has been given a special name: science. Science relies on both types of human knowledge, empirical and theoretical, for maximum reliability. The basic human endeavor to understand Reality as a whole and as clearly as possible is therefore closely linked to scientific thinking. Surprising as it may seem, history seems to broadly support this conclusion.

The awareness of the extraordinary importance of first principles has determined the main road of philosophy and science for more than two millennia after Mesopotamian and pre-Socratic philosophy—and, as I argue above, before it as well.

> The basic idea is [that] there are two "directions" to proceed in our methods of inquiry: one away from what is observed, to the more fundamental, general, and encompassing principles; the other [leads] from the fundamental and general to [possible specific instantiations of those] principles. *The basic aim and method of inquiry identified here can be seen as a theme running throughout the next two millennia of reflection on the correct way to seek after knowledge: carefully observe nature and then seek rules or principles which explain or predict its operation.* (Hepburn and Andersen 2021, italics and insertions in brackets AG)

The search for Nature's first principles has been a common thread in the history of science for at least 2600 years, with mathematics and physics proving to be the most successful. This method was known in some form by Plato and Aristotle, and, among many, reformulated by Francis Bacon and Descartes, the fathers of modern scientific method. It is this ancient insight that was put into the following words by the American philosopher of science Filmer Stuart Cuckow Northrop (1893–1992) in the early 20th century:

> Science proceeds in two opposite directions […]. It moves forward with the aid of exact mathematical formulation [of natural laws] to new applications, and backward [from observable phenomena and natural laws] with the aid of careful logical analysis to first principles. *The fruit of the first movement is applied science, that of the second theoretical science. When this movement toward theoretical science is carried through for all branches of science, we*

> *come to first principles and have philosophy.* (Northrop 1931, 1; italics and insertions in brackets AG)

Similarly, George Gaylord Simpson (1902–1984) wrote in his paper published in the prestigious journal *Science*:

> *Bacon further maintained that the unity of nature would be demonstrated and the sciences would be incorporated into one general body by a fundamental doctrine, a Prima Philosophia, uniting what is common to all the sciences* [...]. In our own days, Einstein and others have sought unification of scientific concepts in the form of principles of increasing generality. The goal is a connected body of theory that might ultimately be completely general in the sense of applying to all material phenomena (Simpson 1963, 87).

The progress of science, in its effort to discover the laws of Nature and then the principles underlying these laws of Nature requires induction, the inference of a general law from particular instances. The inductive method leads to theoretical science. Once theoretical science has uncovered the general laws of Nature, and, in the best case, even the fundamental or first principles, the next step is to apply the laws/principles obtained by theoretical science, and to 'deduce' the conclusions, for example, predict specific phenomena on the basis of the general law/principle. This step is called deduction. *Inductive reasoning leads to theoretical sciences and to an understanding of the nature of Reality.* Deductive reasoning works from the most general laws and principles and leads to applied sciences. When the perfection of theoretical science is carried out in all the fundamental branches of science, and we come to the discovery of the unity of all the fundamental principles of Nature, philosophy, in the form of the unified science capable of understanding all the most general aspects of the Universe, falls into our hands. Through such an all-comprehensive science, which is also philosophy at the same time, the nature of ultimate Reality and the ontological architecture of Reality in its entirety becomes clear. Without any further step, this all-comprehensive science yields an all-comprehensive worldview, an adequate, true picture of the Universe, meant as the unified whole of everything that exists. It is on this rock-solid knowledge of the ultimate Reality that we should build our conduct of life; it is this all-comprehensive science, philosophy, and worldview that is capable of yielding the directive for good governance of societies; it is the all-comprehensive worldview capable of establishing a healthy type of decision-making systems and a long-term sustainable, healthy civilization.

Definition of Health

By health we mean a high level of physical, emotional, and intellectual well-being, including our physical, emotional, and intellectual capacity to cope with our life situations and to develop in the whole system of our relationships, including the high quality of well-being in our relation to our cells, ourselves, our family, our nation, humanity, the living world on Earth and the Living Universe. We cannot buy this good relationship in the shop. This personal relationship is partly shaped by our genetics,

family, and social influences, and partly by ourselves. It is in our most personal, elementary interest to perceive life and the world in the highest possible quality and to give the highest possible quality response to both life and the world.

Achieving and maintaining good health requires continuous efforts that challenge our best abilities. We can only develop through persistent, conscious efforts, from which we can learn how to do better. Our physical well-being is our high quality and broad range of our capability to act. Our emotional well-being is our deep happiness. Our intellectual well-being is our clarity of vision, depth of insights, and the high level of our capacity of solving problems. "The aim and meaning of life are to live usefully in ceaseless development and constant perfection" (Kártyikné 1989, 6, tr. AG). "We are on the right path when we form our individual interests into a common goal" (11, tr. AG).

Sustainability requires a motivation that is at least as strong as the attraction of owning material things (Budapest Centre for Long-term Sustainability 2021). The fact that the life principle is more fundamental than the material principle provides a scientific basis for a motivational system that is stronger and richer than the motivational system for material things. The quality of health is fundamentally characterized by the depth of our feeling and thinking. The deeper we feel and think, the stronger our capacity for motivation. The more broadly we think, the more many-sided and the richer our motivational system becomes. We need a worldview that allows for the deepest and most multi-faceted emotional and intellectual world, the strongest and richest motivational system, and thus enabling us to fulfill our creative potential and achieve the health of our capacity to cope and develop.

Characteristics of a Healthy World View

(1) A worldview is healthy if it is complete at the ontological level, that is, if it corresponds to the whole of life and the Universe as a whole, gives a correct picture of all three fundamental aspects of the Universe, is thorough in terms of its explanatory system down to the fundamental principles, and is balanced. Balanced means that it recognizes the primacy and fundamental nature of the life principle as well as the essential nature of the material principle and the principle of reason. It is able to provide the solid ground, the driving force, the energy, and the compass needed to ensure health in all life situations because it is rooted in the immutable and universal reality of the life principle; and the life principle is capable of realizing its ultimate purpose, the fulfillment of life.

(2) The life principle, which underpins a healthy worldview, encourages us to continuously improve our overall quality of life, to achieve the fullness of our health, and to mobilize all our life energies and capacities to this end.

(3) Since the life instinct has a cosmic scope, it connects us most intimately to each other, to all living things and to the Universe, and inspires us to uplift all life, to recognize and realize the greatest potential of universal life and our personal lives.

Let us keep in mind that the Universe, that is, Nature, is the unified whole of all that exists, or "the" Reality. If we can arrive at a science of Nature in which all of the fundamental disciplines have an explanatory system based on the same, single fundamental principle, and these fundamental disciplines together form a unified, all-comprehensive whole, then, as for example Francis Bacon, Filmer Stuart Cuckow Northrop, and George Gaylord Simpson have suggested, we arrive at a scientific understanding of Reality, a scientific foundation for philosophy, the *prima philosophia*, the *summum bonum*, that is, at an explanation of Reality as a whole.

The Explanatory System of the Natural Sciences is Based on Fundamental Principles

The Principle of Least Action is the Fundamental Principle of Physics

In the 20th century, it became clear that elementary particles are not really elementary, namely because they are based on universal force fields of interactions (Einstein and Infeld 1938; Weinberg 1995). According to quantum field theory, elementary particles are created by universal force fields of interactions described by the fundamental equations of physics. These equations can be derived from the principle of least action (as discussed by Richard P. Feynman in his famous doctoral dissertation in 1942, see also Coopersmith [2017]). The most fundamental quantity of the action principle, the action, is a "cost function" (Rosen, 1967, 4). This special cost function measures the product of energy investment and time investment. Remarkably, these two quantities are of vital importance for all living organisms; these are the two most important factors for the performance of an action. The first formulator of the principle of least action in the history of modern science, Pierre Louis Moreau de Maupertuis (1698–1759), ascribed to the 'action' in the principle of least action the following meaning: "the unity of vital force in the Universe" (Jourdain 1912, 426).

The principle of least action is well known in physics, but the fact that *all* the fundamental equations of physics can be derived from it is rarely recognized. And the outstanding fact that it is precisely the defining property of the fundamental principle that can be used to derive all the fundamental equations of a given discipline seems to have been overlooked in the history of modern physics. The situation can be described by the following quotations:

> The action principle of physics is claimed to be, regarding its form and content, to come nearest to the ideal final aim of theoretical research to condense all natural phenomena into one simple principle, that allows the computation of past and future processes. (Yourgrau and Mandelstam 1955, 126)

> We have found that the Principle of Least Action applies across all scales, from the realm of the microscopic (actually, tinier than that) to the everyday (classical mechanics, engineering, optics, the transmission of radiation, physical chemistry, statistical mechanics, continuum

> mechanics), and on to the whole cosmos (gravitation due to stars, planets, black holes, and gravity waves). (Simpson 1963, 195)
>
> The action principle turns out to be universally applicable in physics. All physical theories can be formulated in terms of an action. Moreover, the formulation of action is elegantly concise. The reader must understand that the whole physical world is described by a single action. (Zee 1986, 109)

It is indisputable that "the principle of the least action leads to the whole of physics" (Coopersmith 2017, vii).

Despite all of these arguments, the principle of least action currently receives little attention among philosophers (Stöltzner 2003). Apparently, this absurd situation is rooted in the economic and consumerist interests that dominate materialistic societies. The principle of least action is still considered a "surprisingly well-kept secret," even though "these ideas are at the heart of the physical sciences and engineering" (Coopersmith 2017, 1). In fact, it is not only that the first principles of science, despite the considerations indicated above, receive undeservedly little attention. The mainstream of modern science and philosophy in recent centuries has explicitly taken the position of rejecting knowledge that allows us to understand the foundations of Reality, ignoring the importance of first principles. Actually, as the Scottish-American philosopher Alasdair C. MacIntyre, Emeritus Professor of Philosophy at the University of Notre Dame, characterizes the present situation of philosophy, "*Nothing is more generally unacceptable in recent philosophy than any conception of a first principle*" (MacIntyre 1990, 4, italics AG).

Given that philosophy studies the most general aspects of Reality, and that the principle of least action is the only universal principle in physics, it seems almost inevitable that philosophy should recognize the all-encompassing importance of the principle of least action. In this work, this very important step is taken: *I take the principle of the least action as the fundamental principle of physics.*

The Present State of the Explanatory System of Physics

Paul Davies, the well-known physicist and cosmologist, describes the state of the explanatory system of physics which still applies today: *Almost all physicists who deal with fundamental problems seem to accept that the laws of physics are "at the base of the rational explanatory chain, in the same way that the axioms of Euclid stand at the base of the logical scheme we call geometry*" (Davies 2004, 5, italics AG). This means that the explanatory chain of modern science stops at natural laws. Let us note that axioms are qualitatively different from laws. For the system of axioms, in mathematics and logic, is the source of laws. The system of axioms plays the same role as the principles. Thus, for example, from the axioms of Euclid it is possible to derive all the laws of (Euclidean) geometry, just as from the axioms of logic all the laws of logic. In the explanatory chain, axioms are found at a deeper level than laws.

By stopping the explanatory scheme of physics at the level of laws, modern physics has taken a step backwards along the millennia-long main road of scientific progress.

This regress may be responsible for the lack of new milestones in the century that has passed since the discovery of quantum physics. Actually, the main road of science is characterised by the discovery of deeper and deeper laws of Nature. This is the road that led to the discovery of biology's fundamental principle.

The Fundamental Principle of Biology, the Principle of Life

While the evolution of physics has stalled at the level of physical laws, thanks to Ervin Bauer, a Hungarian-born biologist, biology reached the mathematical formulation of its fundamental principle. Bauer showed that all the basic biological laws can be derived from a single unifying, universal, and overarching principle. This biological principle was later called the Bauer principle. The Bauer principle states that "[*l*]*iving, and only living, systems are never in equilibrium, and, at the expense of their free energy content, are constantly working against the equilibrium demanded by the laws of physics and chemistry under the given external conditions*" (Bauer 1967, 51, tr. and italics AG). *This means that biology has its own principle, which cannot be derived from the principle of physics, since the essence of life is found precisely in systematic deviations from physical behavior*.

By supplementing Bauer's work with the most powerful tools of modern physics, it turned out that Bauer's principle itself could be derived from a more general principle, the principle of greatest action that involves also the mathematical formulation of biological autonomy (Grandpierre 2007, 2012, 2013; Grandpierre and Kafatos 2012; Grandpierre et al. 2014). The fundamental principle of physics is only a special limiting case of this biological principle, namely the case in which the capability to act is below the Planck limit of quantum-level indeterminacy. This is the reason why the behavior of macroscopic physical bodies can be characterized as inert, or passive. And since the principle of greatest action pervades the Universe as much as the principle of least action, it can be considered a cosmic principle. The two principles prevail simultaneously, since the principle of greatest action works at a more fundamental level—beyond the quantum vacuum—by biologically organizing the spontaneous production of virtual particles which are the sources of physical interactions governed by the principle of least action (Grandpierre 2007, 2014). In other words: the principle of greatest action is the principle governing the biological processes selecting biological aims, while the principle of least action is the principle governing the physical processes that execute these aims.

If we further generalize the principle of greatest action to include the truly biological state variables, that is, the feelings and thoughts that give rise to biological motives, we obtain the life principle. It is the principle of biology and has an all-comprehensive, unifying, and cosmic scope. The biological unification effect is due to the fact that life is manifested in "units," that is, living beings; the unification is the result of the co-*operation* of biological autonomy and the life principle, possible under the right conditions, leading to biological organization according to biological

aims. This cosmic scope of the life principle implies that the Universe is essentially not inanimate but living. Rather than being "lazy" (Coopersmith 2017), the Universe is continuously active beyond the quantum level of Reality, manifesting its living characteristics. Biological action is made possible by the organization in living organisms, which puts the spontaneous production of quantum-level virtual particle pairs at the service of biological aims (Grandpierre 2007, 2012, 2021a, b). Cosmic life "starts" in the microcosm; this is where the diversity of cosmic life is at its greatest.

At the time when Copernicus's work was finally accepted, this was the result of a convergence of new scientific discoveries that had reached a critical mass: the more precise measurements of Tycho Brahe, the arguments of Giordano Bruno, Galileo's experiments, the decisive achievements of Francis Bacon and René Descartes in the philosophy of science, Kepler's laws and then Newton's laws, all in harmony with each other, confirming each other. These agreements had a tremendous influence on the scientific method; they shifted the main aspects and methods of scientific research towards a new, physicalist basis. The situation is now similar to that of the Copernican turn. Independently of each other, a whole range of new disciplines and fields of research, each with their own hitherto unimaginable scope, have emerged on the scene to investigate the relationship between life and the Universe. These are the following: (1) the biocentric cosmology of the eminent biochemist Joseph Lawrence Henderson (Henderson 1913; Grandpierre 2021b, 239–253); (2) anthropic cosmology, which is somewhat misnamed since it is not specified to humans but actually investigates the cosmic role of *life in general* by means of cosmological models (Barrow and Tipler 1986; Grandpierre 2021b, 289–301); (3) laboratory experiments on the origin of life, empirical research showing the quick origin of life on the young Earth, and Oparin's conclusions regarding the existence of an autonomous law of life (Oparin 1960, 5–12; Grandpierre 2021b, 253–283); (4) the theory of a bio-friendly universe (Davies 1998, 2003, 2006); (5) *astrobiology,* the science that studies the relationships between life and the universe, arriving at the general view of astrobiologists that "life is a cosmic imperative" (Davies 1998; Grandpierre 2021b, 284–289); (6) the Gaia theory, according to which Earth is a living system and self-regulating within a range favorable for life (Lovelock 1987; Grandpierre 2021b, 301–322); (7) recent advances in biology (e.g., Tompa and Rose 2011; Grandpierre 2021b, 309); (8) Ervin Bauer's theoretical biology (Bauer 1967 [first 1935]), complemented by the generalization of the least action principle, with an exact mathematical formulation of teleology and (9) the formulation of the principle of greatest action (Grandpierre 2007), and its further development with the quantitative theory of biological, autonomous decision-making (Grandpierre 2012, 2013, 2021b, 169–237; Grandpierre and Kafatos 2012; Grandpierre et al. 2013, 2014). The convergence of these new approaches provides solid scientific evidence, from both theoretical, observational, and experimental perspectives, that *there is a law of Nature that governs the development of the conditions toward becoming favorable to life* (Grandpierre 2021b, 243–322).

These new disciplines thus confirm the fundamental role of the life principle that ensures the leading role of life throughout the Universe. Remarkably, the principle

of greatest action *explains* the existence of this indirectly detected natural law. The combined weight of these disciplines, together with the theoretical biology founded by Ervin Bauer, is capable of triggering the recognition of the fundamental importance of the life-principled outlook. Based on this, it is difficult to avoid the conclusion that we need to permanently and irrevocably change our perception of the foundations of Reality. This new series of scientific contexts of Bauer's masterpiece opens unexpectedly profound and uplifting perspectives for the future of science, philosophy, and civilization, initiating an epoch-making turn comparable to the Copernican revolution. This is all the more so because a comprehensive science based on the principle of matter, the principle of life, and the principle of reason can offer a cosmically grounded ecology on an exact scientific basis and thus scientifically underpin the ecological turn (Budapest Centre for Long-term Sustainability 2021).

Explaining the Independent Decision-Making of Living Organisms

Most physicists believe that the law of conservation of energy is violated within the limits of indeterminacy given by Heisenberg's uncertainty relation (Davies 1984, 104–105). In addition, it is a general view that virtual particles arise spontaneously, without *any* cause. Accordingly, this process is called 'acausal.' However, the principle of causality knows no exceptions. And if there really is no physical cause for the production of virtual particles, there must be another natural cause. In natural science, the next obvious possibility is that, within living organisms, biological causes are responsible for the spontaneous production of such virtual particles. This is all the more so since in biology spontaneous phenomena are a fundamental feature of biologically motivated processes, indicated also by Bauer's theoretical biology. And since, in accordance with the life principle, living beings have biologically controllable energy, such as the so-called volitional energy, they are capable of providing the energy necessary for the creation of virtual particles.

With the life principle and biological autonomy, we have, without any special effort, an explanation that, in one stroke, remedies the two fundamental shortcomings of quantum physics: the violation of the universal principles of conservation of energy and causality. At the same time, and even more importantly, it can explain the physics of biological causality, that is, teleology. It is able to explain the physical realization of an action that can be triggered by biological and intellectual causes. Biological autonomy, through biologically controllable energy behind our ability to make decisions, makes living beings capable of creating virtual particles through decisions corresponding to biologically controllable energy. Recent psychological research has confirmed that our will is indeed capable of mobilizing our free, biologically mobilizable energy (Baumeister 2012). It is also remarkable that the principle of least action itself works through virtual particles. Biological autonomy is able to ensure that physical processes take place according to our will by creating virtual

particles that are in accordance with our will (Grandpierre 2012; Grandpierre and Kafatos 2012, 2013).

Physics, Biology, and Logic Are All Based on Fundamental Principles

Let us now note that not only the sciences of matter and life, but the science of reason, namely, logic, also manifests an axiomatic structure. Logic is the science of correct reasoning, that is, the science of drawing correct conclusions from previous statements, called premises,[3] on the basis of logical laws. Remarkably, this premise–law relation also exists in physics. Physical laws determine the behavior of physical bodies together with the given external conditions; in numerical calculations, the differential equations of physics work with given input conditions. The input conditions of physical equations can be set in parallel with the premises of the laws of logic. In biology, the situation is similar; in the case of living organisms, the decisions arising from biological autonomy play the role of input conditions.

When the system of the axioms of logic is generalized into a principle of reason that works with premises arising both from "external" as well as "internal" observations of natural rational and emotional motivations arising from the life principle, then it becomes clear that physics, biology, and logic are all based on fundamental principles. All three have an explanatory system with three levels corresponding to phenomena, natural laws, and principles. In the comprehensive framework unifying the sciences of matter, life, and reason, it becomes clear that the Universe is based on the principles of matter, life, and reason. In this way, we have arrived at a comprehensive, ontologically complete, scientific understanding of Nature, so that the scientific basis of philosophy falls into our hands.

The Thrice Threefold, Hierarchical Structure of the Universe

It is important to distinguish between, on the one hand, the equations of theoretical sciences, which "exist" only in our mind and become more and more precise with the development of science, and, on the other hand, the natural laws they describe, which are their equivalents existing in Nature. Let us now consider the relationship between the explanatory chain of science and its equivalent in Nature. Let us add that the equations of natural sciences are laws of changes, and changes are due to causes. The explanatory chain of science is directed toward discovering the causes acting in Nature. The most important cause is the first cause.

In the light of these considerations, it becomes clear that the explanatory chain of science mirrors the causal chain of Nature, but in reverse order. Accordingly, the first causes of Nature are found in the first principles and their input conditions. We have

arrived at the causal structure of the Universe. We have found it in a triple trinity. This triple trinity is the trinity of phenomena, laws, and principles in physics, biology, and in the science of logical thinking, the latter of which we may call *noology,* since in ancient Greek philosophy the rational mind was called *nous* (νοῦς).

The Seven Cosmic Communities of Life—Communities Within Communities up to the Living Universe

Cosmic Life can act locally in physical reality only through the physical units of action capable of realizing its biological ends. Recognizing that the Living Universe must be capable of action at all spatial scales, and that its only means is the biological organization of the free energies available (Grandpierre 2018), we can realize that in order to be able to live, the Living Universe must be able to act on all scales. This requirement demands the existence of "life units" with appropriate dimensions. The Universe must develop living organisms at microscopic, macroscopic, and cosmic scales. Given that there is an unlimited amount of free energy available in the quantum vacuum, and that this energy can be organized by a life principle that operates beyond quantum physics, small enough units of life capable of operating on microscopic scales are needed. This branch of cosmic evolution led to the origin of the first cells on Earth (Grandpierre 2013). Once living cells are developed on the basis of the cosmic life principle, the life principle also prepares the ground to guide biological evolution toward more complex life. This allows the evolution of living organisms to develop units of life on a significantly larger macroscopic scale, that is, multicellular beings. The presence of planetary-level free energies allows the emergence of planetary-level life. According to comprehensive science, this branch of cosmic evolution has led to the development of the self-regulating Gaia (Lovelock 1987) and to Helios, the Sun, which is alive and has its own activity that is called solar activity, and which is constantly reorganizing its activity according to the Bauer principle (Grandpierre 2015, 2018).

Now let us take into account the fundamental fact that life is present always in the form of communities. The life of the individual is only possible through the previous existence of the family. The existence of the family is based on the existence of the nation, the existence of the nation on the existence of humanity, the existence of humanity on the existence of life on Earth; and the evolution of life on Earth is a branch of cosmic evolution. From the point of view of humanity, there are seven units of life: cell, individual, family, nation, humanity, Gaia, and the Living Universe. These seven levels of organization can be considered the "ladder" of cosmic life. We belong to all of them simultaneously, and we have a responsibility to all of them. It is this interconnectedness that gives human beings their place in the world and in the Universe.

In summary, there are three levels of Reality: phenomena, laws, and first principles. There are basically three kinds of existence, corresponding to matter, life, and rational

mind. We have come to a scientific mapping and explanation of the architecture of the Universe, and found it to manifest a $3 \times 3 \times 7$ structure.

From here, we arrive at the next set of questions: Where does this Living Universe come from? If the Universe is a unified whole encompassing all that exists, then it cannot have originated from anything other than its own pre-existence. But how can it arise from itself? How can this question be clarified?

There is Only One Entity that Can Exist by Its Own Power: Cosmic Life

The ancient Greeks called the *self-existent cosmic Reality* the 'first cause,' 'God,' or 'ultimate substance.' The existence of a self-existent, primordial cosmic Reality means that this Reality, acting as its own cause, has created itself. In short, it must be not only self-existing but also self-creating. Note that self-creation is action. Action assumes the presence of life. Consequently, self-creation assumes life. Now, let us also consider that life is not only necessary but also a sufficient condition for Reality existing by its own power, because the essence of life is precisely that it creates life and sustains life, that is, itself. Life has a twofold nature: It not only exists, but also, and this is its essential nature, creates itself. It is that kind of existence that is directed toward creating itself, directed toward developing and realizing its full potentials, the totality of itself. Cosmic life is the self-creating activity of the whole of Reality.

For example, the material or physical universe cannot come into existence by itself; even the Big Bang assumes a 'starting up,' a so-called, extremely specific, pre-existent 'quantum fluctuation' that initiates the process. This process cannot be acausal, so if it does not have a physical cause, it must have a *biological cause*, and this assumes the *pre-existence of life*.

Consequently, cosmic life is eternal. Cosmic life is itself "the work in process" of the 'first cause' which is active in the eternal functioning of cosmic life. Cosmic life is the 'ultimate substance' postulated by the Greeks. In this respect, cosmic life can be considered as divine life. Actually, cosmic life has more 'divine' aspects. It is noteworthy that there is only one life principle in the Universe—in the same way as there is only one physical principle in Nature. This life principle permeates everything that exists, including us as living beings. This fundamental Reality acts 'within' us; from the aspect of our 'self'—defined as our decision-making center—it is the life instinct. The life principle is both immanent and transcendent, since we have an access to the life instinct 'internally,' and it is transcendent, since it is 'beyond' the observable universe. That is to say, the life instinct of living organisms and of the Living Universe are identical. In the causal order of life, the 'first' cause acts at the cosmic level. In the case of an eternal Being we cannot speak of a 'first' cause in time, only in a logical sense. Since the living Universe is the primordial Being itself, we can in the logical sense regard its first division into the material world, the world of life, and the world of reason as the first step of its self-realization. This 'first division'

of cosmic life into three kinds of 'realities' is a step in the logical sense, since in Reality they are not only differentiated but also interrelated and integrated. But the extraordinary, ontological depth of their distinguishability indicates that matter, life, and rational mind are the most fundamental features of the Universe.

Let us make the next step. An understanding of the logical relationship between the principle of matter, the principle of life, and the principle of reason brings us closer to a deeper understanding of ontology.

On the Relationship Between the Principle of Least Action and the Principle of Greatest Action

Let me illustrate the relationship between the principle of least action and the principle of greatest action by means of a simple example.

A company building bridges aims to build as many bridges as possible every year. This corresponds to the principle of greatest action. It can only build as many bridges as possible if it builds each bridge in the most economical way possible. It is precisely the principle of least action that ideally helps to achieve this, because the principle of least action is the principle of the most economical action in terms of time and energy consumption. A company that operates on the principle of greatest action can only do so if it follows the principle of least action, after it has decided on its concrete goals positioned in space and time on the basis of the principle of greatest action. At the level of Nature, this means that the principle of least action is a necessary condition for physically realizing the biological aims specified in accordance with the principle of greatest action. This argument illuminates the *cosmic necessity* of the existence of the principle of least action. The necessity of the principle of least action involves, as a consequence, that the laws of Nature are eternal and invariable.

Unexpectedly, and without any effort to do so, the explanation of the hitherto seemingly insoluble question of the origin of physical laws fell into our hands. They arise as a necessity of the principle of the greatest action, as an integral part of it.

The Laws of Nature Exist in Reality and Have a Causal Role

There is currently no universally accepted criterion for existence. There is, however, one criterion that is self-evident. Samuel Alexander, the Australian-born British philosopher, has a famous dictum: "To be real is to have causal power" (quoted in Kim 1993, 348).[4] Natural laws are the sources of interactions, forces, changes—laws of change. Without natural laws, there would be no interactions, and there would be no changes. This means that without natural laws there would be no objects, since they are the manifestations of interactions, and no causes, since causes are the sources of change. In universal Reality, *natural laws are the source of causes, in the same*

way that interactions are more fundamental than particles (Einstein and Infeld 1938, 313; Weinberg 1995). Natural laws are the cause, phenomena are the effect. Without the real existence of natural laws, the forces that hold molecules and atoms together would not exist, and thus no object would exist.

The source of physical change is force, the source of biological change is motivation, and the source of noological change is thought. The fundamental disciplines correspond to fundamental types of causes. The fundamental types of causes are physical, biological, and noological causes. There are no other fundamental types of causality. This corresponds to the fact that in natural science there are only three fundamental disciplines, related to the three fundamental principles of Nature.

Consider that life is first and foremost a ceaseless action, but also a myriad of possibilities for action that allows it to elevate itself over an almost unfathomably long period of time, by unfolding and fulfilling its highest potential. *Modern science has been unable to take into account the part of Reality without which life would not exist and would not be possible, namely the instinct for life. It is therefore of immense importance that it has become scientifically and philosophically understandable through the Bauer principle and its most general form, the principle of life.*

Nowadays, it is generally believed that life is only about survival. The discovery of the life principle tells something very different. The life principle tells us that life is to be directed toward a high quality of life. *Life is primarily directed toward feeling ourselves well, high above the level of mere survival, and this ensures the prospects to feel ourselves well, or better.* Our feelings are central to our quality of life. We conceive our instinct for life by our natural, instinctive feelings. Above all, life is about feeling good, individually and, more importantly, in our relationships with our families, our social communities, and Nature. The life principle is the principle of good feelings. The dignity of life is that every living being has a nature-given right to feel itself well, to feel good in the present, and good or better in the future. And that is to be respected fully, to the greatest extent. Without the life principle, the Universe would be completely inanimate. Without the life principle, rational mind cannot exist. Without the life principle, the Universe would be completely empty of meaning and values. It is the life principle that is the greatest treasure of the Universe, the source of all values. Its presence within us is the highest treasure of our life, and we are naturally inclined to pay attention, nourish, and care for this cosmic treasure in all its manifestations. We are most fundamentally and most personally interwoven with each other and with every living being through the life principle. This is why, if we appreciate our life instinct, we should appreciate the same life instinct in all its manifestations. *This recognition is the basis and essence of an environmental philosophy that values living communities* (Patterson 1998).

Life without its own natural law could not be fundamental and could not be an independent Reality. For without biological laws, life necessarily would become an appendage of matter; it would lose its dignity and intrinsic value, because without its own law, it would be subservient to physical laws and conditions. To recognize the Reality of the life principle is to recognize that life is an autonomous Reality having its own characteristics, following its own values, and with its own possibilities that

are different from those of physics and incomparably greater, and all of this is due to the fact that it has its own independent principle.

We All Need to Know What Reality is, Since Our Future Fundamentally Depends on Our Understanding of Reality

There is still no consensus as to what philosophy is all about. To clarify what philosophy is, it is important to see that, at least as a matter of human nature, all human beings need a correct knowledge of Reality, and first and foremost a knowledge of the overarching principles of Reality. The three main branches of such a knowledge of Reality are the knowledge of life, the knowledge of the world, and the knowledge of humankind. And if philosophy is the study of the most general relations between these, then it is understood as a way of acquiring the most general knowledge of vital importance to all human beings. This philosophy, which is vital for every human being and seeks to show the most general interrelationships between life, the Universe, and humankind, can be called general philosophy. When this general philosophy reaches the knowledge of the most general principles, it becomes capable of informing humankind about the fundamental nature of life, the Universe, and humankind, thus providing a sound basis for a healthy culture.

For each of us, it is vitally important to understand general philosophy. It is also in our personal interest to make this general philosophy as simple, transparent, and effective as possible. Regarding the vital importance of our human relations for our full health, this philosophy has to be made understandable and easily applicable to everyone. We must therefore ask: What are the most effective tools of this general philosophy?

The Two Most Effective Tools of General Philosophy: Outlook of Life and Worldview

The two fundamental branches of general philosophy are the study of life and Nature. Humankind is living, fundamentally, in Nature. The nature-given life instinct sets the goals, and Nature provides the means to achieve them. *First of all, we need a clear, correct, adequate perception and understanding of the life instinct in a way that represents a suitable basis for our fundamental decision-making system. Second, we need to know and understand the fundamental constituents of Nature.*

If humankind acquires an essentially complete knowledge of the full explanatory systems of these two main branches of Reality, all humans will be able to shape their basic decision system accordingly. The explanatory system of life is called an outlook of life, the explanatory system of the world is called a worldview. *The two most effective tools of general philosophy are the outlook of life and the worldview.*

For humankind to live in harmony with the life instinct and with the Universe, it is necessary that general philosophy should be a unified system of knowledge. For this, the outlook of life and the worldview must be in harmony. This is only possible if the outlook of life is cosmocentric and the worldview is fundamentally life-based. Note that by the concept of the Universe we mean the unified whole of all that exists. The harmony of the outlook of life and the worldview is only possible if the Universe is alive. This means that we all need a life-centered worldview.

Civilizations Are Based on Their Worldviews, Which Determine Their Decision-Making

Worldview is defined as the way we conceive, that is, interpret and evaluate the world, fundamentally Nature. This is why "the intellectual level in every age has adapted to the generally accepted theories of the Universe" (Couderc 1964, 8, tr. AG).

An adequate worldview is the main goal and the most effective means of philosophy. It becomes even more effective when we recognize its basic type, which is determined by the ontological principles it takes into account and the relative weight attributed to them. The predominant worldview type determines the basic types of civilizations, their mindsets, their intellectual horizons, and their intellectual power. The best-known types of Western worldviews are the various appearances of materialist,[5] idealist,[6] and the dualist worldviews, the latter of which see both matter and consciousness as fundamental. In the light of the above arguments, all of these worldviews are fundamentally incomplete, because they ignore the most fundamental principle of the Universe, namely, the life principle.

All of our choices are ultimately determined by the way we interpret and value life and the world. If our mindset is, unconsciously, narrower than full Reality, we can still be consciously satisfied with the richness of choices available in our culture. Narrow mindsets alienate us from life and the world. Alienation is an ontological disease that destroys our relationship to the ontological basis of our personality and seriously diminishes our quality of life.

Knowledge is what offers humanity its greatest opportunities, and also its greatest dangers if it is inadequate or incomplete. There is no doubt that there is a physical aspect of life, and the physical sciences, including biophysics, have made significant strides in understanding these. But life, and it is Ervin Bauer who has done most to understand it, is not limited to its physical aspects. The central problems of biology (Szent-Györgyi 1970, 63), the nature of biological work and behavior, together with the central role of purposefulness in biology, cannot be understood by physics because its horizon is too narrow.

It is also important to see that materialism is a very profound metaphysical assumption about the nature of Reality. Since most people are unprepared to challenge this view to obtain a better foundation which is more profound and more powerful, the materialistic worldview so far tends to become, in practice, an unchallenged and

unobserved magic-weapon of Western civilization, orienting most people toward a materialistic way of life.

Obstacles on the Road to Changing the Fundamental Type of Our Worldview into the Comprehensive, Ecological Worldview

The Difficulties of Changing Worldviews

The subordination of physical laws to the laws of biology, indicated also by the derivability of the physical principle from the biological principle as one of its limiting cases, changes the basis of our conception of Reality. After all, the physicalist worldview is the basis for the popular idea that, for example, human beings are basically made up of atoms. But if we conceive of ourselves as consisting of atoms governed by the physical laws, we become alienated from ourselves. To regain our lost selves, we must understand that life is more fundamental than matter. In fact, we have to rethink everything, expand our whole system of thinking, and build it on deeper foundations. In other words, our perception of Reality has to improve, namely by recognizing that our personality is based on our image of ourselves. This image is based on our image of humankind, which is based on our worldview. Therefore we have to build our worldview on a solid, correct foundation.

Nowadays we live in a situation in which *we have to change the foundation of our view of Reality*. In this regard, it is as if the ground beneath us, which we thought was an immovable continent, turns out to be a relatively small ice floe drifting toward a fatal situation. Now we have to leave this too-small sheet of ice and jump over to a previously unobserved continent in our neighborhood, which until now has been completely shrouded in fog. Only now is the fog dissipating and the continent becoming visible.

We have to admit that this is not an everyday situation, but one that requires an unusual effort to deal with. We need a preliminary mapping of the newly discovered continent and careful planning of the jump. Understanding Bauer's biology requires us to take an extraordinarily unusual step, the like of which we have never had to take in four hundred years. It is this unexpected challenge that has made it extremely difficult to understand Bauer's theoretical biology to date. We all have a seemingly rock-solid understanding of Reality, and it seems all the more solid because most people have the same conviction, and it is also underpinned by the dominant, physicalist worldview. Moreover, the dominant materialistic view is rooted in an ontological depth that is virtually inaccessible to most people. Replacing the hegemonic, centuries-old, deeply ingrained, and thought to be unquestionably solid physical worldview with the newly arising, ontologically deeper biological basis for understanding the world indeed presents us with a uniquely unexpected and profound turn in the history of modern science.

The scope and power of the human spirit is given by the breadth and explanatory depth of its worldview. A comprehensive worldview is much broader and much deeper than a materialistic worldview. It broadens humanity's intellectual horizons and increases its intellectual power to an extent never before suspected. All the paradigm shifts of the past centuries have occurred within the physical worldview. This time it is not a paradigm shift of this kind. Rather, we are confronted with the necessity of a qualitatively larger change, namely a shift of worldviews. It is this change of worldview, which qualitatively enhances the worldview that is the reference point for our understanding of Reality, that is the greatest significance of the Bauer principle. It is this change of outlook, which goes far beyond any preconceived notions, that gives Bauer's work its greatest significance.

Misunderstanding the Importance of Fundamental Principles

Although more and more physicists recognize it, the mainstream of physics still does not admit the fundamental importance of the principle of the least action. The prevailing view is that the principle of least action is mathematically equivalent to the fundamental equations of physics. But this view is based on the fact that the principle of least action is the source of physical laws. However, the principle of least action also has important advantages over physical laws, such as a panoramic overview of the whole process under consideration. While the basic differential equations of physics determine the course of physical processes as small changes from the previous state, step by step, the principle of least action determines the physical process between the initial and the final state. To use an analogy, the fundamental equations of physics work like "common soldiers," but the whole process, the strategy, is determined by their "general," the principle of least action. And what has been overlooked so far is that since the fundamental principle of physics determines all of physics, the principle of least action can be regarded as the definition of physics. Since the principle of least action is the principle of minimal action, *physics is the science of inanimate matter*.

This is of extraordinary importance. For until now it has not been clear what physics is, whether it is a complete science of Nature or not; and until it is unclear what physics is, it is difficult to recognize what biology is, and therefore, what life is.

Jaegwon Kim, perhaps the most distinguished scholar in physicalism, has put the essence of physicalism in this way: *Physicalism implies that physical theory can, in principle, provide a* "*complete and comprehensive theory of the world as a whole*" (Kim 1993, 96, italics AG), rather than simply a 'physical field' understood as a limited part of the world. Nevertheless, it is easy to realize that biological processes are not *governed* by the principle of least action. We have found scientific evidence to disprove physicalism. With Ervin Bauer's demonstration of the existence of biology's own laws and fundamental principle, including the demonstration that the Bauer principle is independent of physics, physicalism can be considered to have

been scientifically disproved. Considering that physicalism is the dominant scientific worldview of our time, this in itself is more than a remarkable achievement.

Even more importantly, it is clear from comprehensive biology that the fundamental principles of the Universe have a worldview significance. The biological principle determines the unified system of conditions even for the physical processes that take place in the living organism, in accordance with biological goals. This is the biological control of physical laws. It is called biological organization. In other words, by continuously modifying the input conditions of physical laws in a way suitable for biological purposes, biology turns out to be the control science of physics.

Compatibility with Quantum Physics in the Absence of a Biological Law of Nature Does not Imply a New Biology

A consistently biological, scientific understanding of life is impossible without knowledge of the fundamental principle of life. The theoretical biology founded by Ervin Bauer owes its extraordinary scientific and philosophical importance to one single fact: the discovery and mathematical formulation of the fundamental principle of biology, from which Bauer derived all the basic equations of biology, including the equations of metabolism, reproduction, growth, excitability, explaining all the basic phenomena of life (Bauer principle [Bauer 1967]). With the discovery of the life principle, obtained by further development of the Bauer principle, the life instinct became suddenly and unexpectedly comprehensible on an exact scientific basis. Furthermore, building the entire architecture of theoretical biology on a single, overarching fundamental principle can be paralleled with the similar explanatory scheme of physics and logic. Surprisingly, the fundamental domains of the Universe, matter, life, and mind fit together like pieces of a mosaic puzzle, unveiling the full architecture of the Universe. Remarkably, the principle of matter, the principle of life, and the principle of reason are to be seen as scientific principles that have an extraordinary worldview significance, enlightening the blueprint of Reality by the all-encompassing fundamental principles of all existence. For the first time in the history of natural sciences, a complete picture has been obtained about Nature by a comprehensive science covering all the fundamental branches of natural science. This discovery draws attention to the extraordinary scientific and philosophical significance of the three fundamental principles unifying and mobilizing the entire Universe. The worldview significance of the overarching fundamental principles refutes the view that the basic worldview shift needed for sustainability is possible without the discovery of a biological principle that is independent of physics.

Bauer's seminal work was published in Russian in 1935 and in Hungarian in 1967; it has not yet been translated into other languages and is therefore relatively little known. The "fate" of this most extraordinary book is also most extraordinary, because its study and understanding have been hampered by a particular set of historical, political, scientific, and ideological obstacles. Bauer's major work has been likened

by many to Einstein's main goal, that is, the discovery of the single equation of physics encompassing the "essence of Nature," from which all physical phenomena can be derived. Aleksei A. Ukhtomsky, the world-renowned researcher of neuroscience and founding director of the Institute of Life Sciences at the Leningrad State University, dedicated a reprint of one of his papers to Ervin Bauer: "To the Einstein of Biology" (Bauer 2003).

Nevertheless, the interpretations of Bauer's work so far are arguably wrong. Typically, even his greatest admirer and reviver of Bauer's work, Boris Petrovich Tokin, Director of the State Institute of Biology, Moscow–Leningrad, was wary of taking all the basic biological laws to be derivable from Bauer's principle—simply, as Tokin himself pointed out, because he knew of no such thing in physics (Tokin 1965, 116). But, as we have seen above, the principle of least action is such a thing.

It is no wonder, then, that even such exceptional scholars as the famous sinologist Joseph Needham were unaware of the existence of the Bauer principle and of the ontological significance of the fundamental principle of physics. In his view, scientific progress since the nineteenth century has transcended mechanical materialism, and the modern new scientific theories represented by Darwin, Einstein, and Planck "necessitated the adoption of a more organic philosophy" (Needham 1956, 505), and "[m]odern science and the philosophy of organism, with its integrative levels, have come back to this wisdom [of the Chinese worldview]" (583, insertions in brackets AG).

J. Baird Callicott, a distinguished research professor of the Department of Philosophy and Religion Studies and the Institute of Applied Sciences at the University of North Texas, begins his study "Metaphysical Implications of Ecology" with the idea that philosophy is substantively informed only by the universal and foundational sciences (Callicott 1989, 59). As he continues, "[e]cology and contemporary physics, interestingly, complement one another conceptually and converge toward the same metaphysical notions" (59). He adds that "[a] consolidated metaphysical consensus thus appears to be presently emerging from twentieth-century science" (59). A similar view is expressed by the Chinese philosopher Wang Kun, a professor at the School of Marxism of Zhejiang Normal University, who writes: "China's organic naturalistic philosophy is consistent with the foundation of modern new scientific theory and philosophy" (Wang 2014, 201, tr. AG).

Those who see modern physics as a step toward an organic worldview are right in that the strict determinism of classical physics ruled out the existence of life, while the indeterminacy of quantum physics made physics *compatible* with biology. Professor Wang Kun is right; organic philosophy is, indeed, *consistent* with modern physics. But the unification of modern physics with organic philosophy requires something much more important, a fundamental principle of biology that enlightens the entire universe of biology, namely in the sense that it exists *beyond* the domain of quantum physics. Such a fundamental addition to natural sciences can only be achieved on the basis of the universal principle of life. It would be a mistake to assume that relativity and quantum physics are based on an organic conception of the universe. Both are based on the principle of least action, the fundamental principle of inanimate matter. A prerequisite for both a science-based organic cosmology and ecology is

the emergence of an exact science which is derived from a life principle providing scientific proof that the Universe is alive.

It is no mere coincidence that many consider the scientific solution of the problem of what gives intrinsic value to Nature as the "Holy Grail" of environmental philosophy (Callicott 2012, 767). For in a lifeless Universe what we call 'life' cannot be present. An organic cosmology cannot be qualified as scientifically grounded if it is merely compatible with, but does not transcend, physical laws. *This cannot be emphasized enough: The existence of a biological law, independent of physical laws, is a prerequisite for life.* Bauer puts it as follows:

> We can say that living matter has no laws of motion of its own, and that the laws of motion of living and inanimate matter are essentially identical. In that case, if we are consistent, we cannot speak of living matter in general. However, in this way biology becomes nothing more than applied physics and chemistry, that is, the application of physical and chemical laws to the complex systems we call living things. (Bauer 1967, 18, tr. AG)

Without laws, we cannot talk about theoretical science. It is the most general theoretical laws that make science so powerful. Only life with its own laws can give intrinsic value to the Universe. The task to put ecology on a scientific and cosmological basis requires us to take into account the leading role of the biological principle in the Universe.

The Cosmic Life Instinct Shows the Way to a Healthy Ecological Civilization

The prevailing view today is that it is *science,* implicitly identified with physics and confined to physics, that really matters, and that philosophy is of secondary or of no importance. It is important to see that science and philosophy are important in different ways. While the most effective instrument of science is given by the fundamental principles, the most effective instrument of philosophy is its worldview, and its most significant achievement is the creation and maintenance of civilizations through the development of a dominant worldview in society.

The great German philosopher Ludwig Busse (1862–1907) sees the entire history of philosophy as a series of attempts to establish a worldview (Busse 1917; cited in Péter 1939, 11). Accordingly, achieving a realistic, adequate worldview is the ultimate goal and fulfilment of philosophy. As David Naugle, who is a professor at Dallas Baptist University, writes in his book on worldview:

> A world "hypothesis," according to Freud, should be able to solve all problems, satisfy all interrogation, and put everything in its place. As an ultimate human ideal, a Weltanschauung [a worldview] in which one trusts should provide peace of mind or security by specifying the summum bonum and designating how to deal with life in practical ways. (Naugle 2002, 213)

In the social sphere, worldview is more important than science, because it fundamentally determines the perception of Reality, the way of thinking, the main direction of life paths, and the fundamental type of decision systems of the majority of people—and this can be understood most effectively in the light of comprehensive ontology.

Through institutionalized education, the fundamentally erroneous physicalist worldview becomes more and more deeply ingrained from generation to generation. The world corresponding to physicalism, which regards the inanimate phenomenal world as exclusive, exists only in our minds. Physicalist cosmologies describe the observable universe only in some respects and in broad strokes. Cosmological models of physics are unable to give account of the existence of even such a simple thing like a teapot, because they lack the complexity input of such details necessary to do so. But it is precisely in the richness of such complexities and fine details that life can unfold; and many little streams make great rivers, especially on a cosmic scale.

The physicalist worldview is "sick" because it is fundamentally incomplete. This is a fatal circumstance, because this fictitious worldview determines the main goal of modern societies, which consists of increasing material power and wealth regardless of all other considerations. It is this fictitious, one-sided worldview that determines most people's mindsets and basic attitudes toward their nature-given selves, each other, and their natural environment. It is this mind-narrowing worldview that determines the fundamental system of values in human societies. The almost incomprehensibly huge social changes that have taken place since the Middle Ages could not have happened without the social dominance of the new, physics-related worldview. In this context, it is clear that Bauer's theoretical biology lays the foundation for a fundamentally new era of a civilization based on a healthy, comprehensive, and life-principled worldview (Budapest Centre for Long-term Sustainability 2021).

The three fundamental principles, together with biological autonomy, can be referred to as the essence of the Universe. Learning and understanding their roles in the comprehensive worldview could serve as the basis for the general education necessary for the next generations to be able to build a healthy civilization. Since the basic type of worldview determines the basic type of socially dominant decision-making systems that dictate the basic type of civilizations, a comprehensive and healthy worldview allows for the foundation of a comprehensively healthy civilization.

Matter is only a tool in humankind's hands to achieve a happy, meaningful, and fulfilling life. This goal cannot be achieved without unceasing inner striving, without mobilizing our best abilities in a purposeful way, taking into account the comprehensive, communal nature of life. In order to improve our overall quality of life, we all have a personal stake in improving the quality of life in our communities and our environment. The more fully one lives in harmony with the cosmic life instinct, the closer one comes to the fullness of life, that is, to becoming a fully living being and to becoming "fully human." And since the life instinct embraces the whole of the Universe, living in harmony with the life instinct means a healthy relationship with Nature. Let us add that the ultimate meaning of life can only be ensured

by conceiving the living and rational Nature of the Living Universe and by developing an attitude that establishes a good relationship with Nature. And this requires continuous emotional and intellectual development.

Taking into account the communal, social, and cosmic nature of our quality of life links our destiny to sustainability. Likewise, social sustainability requires a comprehensive worldview that prioritizes the value of life over the value of matter, while recognizing the value of matter and reason (Budapest Centre for Long-term Sustainability 2021). Sustainability requires a generation growing up in a culture that prioritizes the harmony between individual communal and cosmic values of life over an attitude of "profit above all else."

The greatest turns in science since Copernicus have all brought paradigm shifts within the physics-based, or rather, the physicalist worldview. The work of Ervin Bauer and the generalization of the Bauer principle to the natural motives of life represent the first attempts to go beyond this outdated worldview, namely *to establish a deeper, biological worldview, and thus to represent a major advance, even greater than that of the Copernican turn, in our understanding of the structure and nature of the Universe.*

The Life Instinct is an Essential Guide for All Aspects of Life

The cosmic life principle permeates all living beings. This life principle, when conceived from a personal perspective, can be called the *life instinct*. This instinct for life is what makes the life of living beings possible. The life instinct is so fundamental to all aspects of life that it has always played a fundamental role in all societies. Only in Western civilization has it been relegated to the background, but its myriad social roles have been preserved under different names and reinterpretations.

The content of the scientific formulation of the life principle makes it clear that the life instinct is not directed to mere survival but to *well-being and improvement of the comprehensive quality of life* in all its aspects.

Through the concept of the life principle given above, we can see the essence of life as the motivating 'urge,' 'intuition,' 'hint,' or 'inner impulse' that drives every living being at every moment to do everything possible to improve its life. This function of the life principle corresponds to the ancient concept of *'life force.'* The life force is manifested in the power that *heals* our wounds, propels the *development* of our organism since our conception, and *regenerates* our organism. The life force is the force of Nature which, acting within our organisms, inspires us to deep and true happiness, to *fulfil* and *flourish* our best physical, mental, and spiritual capacities, to create the most wonderful life we can.

In the literal sense, we live only when we live with our life force. That is, we live only to the extent that we live with our *full life force***.** Every blade of grass has the capacity to live with full vitality from morning to night, day after day, for its entire life. If we do not want to lag behind them, we must do the same.

The life principle connects us to the *Living Universe*. In different cultures and different epochs, it may have different names like the cosmic life force, Mother Nature, *Dao*, *qi*, *rta*, *dharma*, Big Spirit, Supreme Being, or God in the sense of natural religion. Some cultures put emphasis on the life principle, such as the Chinese; others emphasize the aspect of decision-making, or biological autonomy, as Western civilization does. In full recognition of Reality, the primary role can be attributed to the life principle, since it is the directive power of the Living Universe. Knowing and keeping in mind the primary role of the life principle encourages us to nurture that connection. This role of the life principle is the same as that of those religions the essence of which is to cultivate the relationship between man and God. Its role as the supreme value, compass, and guide corresponds to the concept of the *Dao***,** the Way. The life principle is the *path of life* as it is given by Nature.

The life principle connects us to "higher-than-individual," communal, and cosmic levels of life's organization. It corresponds to the role of *spirituality***.**

The life instinct is the strongest *bond* that binds us to life. Our deepest feelings come from the life instinct. The feelings that connect our being most deeply to life can be called true *love of life*. The instinct for life is the source, the real basis of our deepest feelings for our family, for our country, for humanity as the family of all nations, for Nature, and, ultimately, for the Universe, the unified whole of everything that exists: Reality.

For a while after we are born, our response to everything that happens to us is in total resonance with the life instinct. Natural life is to live according to the values of the life instinct. It is the life instinct that sets the primary goals for our personal development, to improve the quality of life in all of its aspects. The life instinct is the real basis of our natural *self-identity*. Ultimately, our true, ultimately real self is the unity of the life principle and biological autonomy.

The life instinct is the same in all living beings. In our deepest and most essential self-identity, we are identical to each other. All of us are instinctively inspired to govern our life according to the cosmic life principle to make life the best it can be on this planet. This is the basis of natural *morality*, suggesting that we must act for the betterment for all living beings. Life is most beautiful in the comprehensive harmony of all life.

The cosmic scope of the life instinct is the source of respecting all life, of loving, appreciating, and respecting Nature. This is the basis of the *ecological* worldview.

Soul and reason are our treasures given by Nature, prompting us to achieve the aims given by the life instinct on Earth. The world provides the possibilities for realizing the life instinct. Since the life instinct is directed to the improvement, happiness, fulfilment, and beauty of universal life, the natural task of soul and reason is to discover the best possibilities of realizing these ends. This natural aspiration is the source of the desire to know life and the world, to discover life and the world as fully as possible. It is the source of innate curiosity, of the *desire to know*. The instinct for life is the source, the driving force, and the compass for understanding life and the world. It is the stimulus to develop philosophy and science so that both become complete, simple, and transparent.

Cosmic life brings itself to life; it is the source of *creativity*. Creativity in *art* is not without the guiding influence of the life instinct. There always have been, and always will be, composers, poets, and writers who wish to create the most beautiful pieces of art, and scientists and philosophers who strive to create the best theory.

Life's self-creating, self-fulfilling, and self-perfecting striving, this "positive feedback" of life, is the basis of the self-reflexive nature of *human consciousness*, of not only knowing, but of knowing that we know.

Ultimately, *the quality of our lives* depends on us, on our mentality, on our attitude, on our outlook. We can most fundamentally improve the quality of our lives if we have a correct, deep, and comprehensive worldview that guides our basic *decision-making* system.

It is the natural task of our soul, that is to say, of our unified and organized world of feelings, based on our life instinct, to conceive the life instinct as faithfully and as fully as possible. Our soul can conceive of the life instinct in an authentic way if our soul is clean, uncorrupted, and maintains its natural integrity. It is the natural task of the human intellect to comprehend the world as clearly and completely as possible. It is the natural task of the self, on the basis of our soul and intellect, to recognize the possibilities offered by the world that best correspond to the values of the life instinct, to make the *best decision*, and to make it come true.

This list is far from complete. It is natural that in all areas of life, even in modern society, the directive influence of the life principle is felt. But it is unnatural when the mainstream of society, media, science, philosophy, and culture turns away from the values of the life principle and hands over the leadership role to the principle of matter. Today, the conditions are ripe for a comprehensive, life-principled approach to emerge. The understanding of a healthy, life-principled, community- and nature-centered worldview is now within everyone's reach, thanks to the advancement of science to the level of comprehensive science.

The practical relevance of all these considerations is further underscored by the fact that in today's world, education and the "nervous system" of society, namely, the mass media, have increasingly taken the lead in child rearing. In recent decades, the Western school system and the Western media have played an increasingly important role in the life of every country. This change prepares the ground for the further strengthening of the dominant role of the materialist(ic) approach. So far, there seems to be a lack of awareness that this practice is increasingly ingraining a physicalist, materialistic, and nihilistic worldview into current and future generations. If this trend is to be reversed, namely for the sake of the development of a healthy civilization, it is essential that education and the "spirit" of the mass media are based on a healthy world view.

Notes

1. The term cosmic law designates the principle or set of principles believed to represent the most generalized Nature of the order of things in the Universe. Confidence in the existence

of a principle of order in the Universe at large is, in turn, reflected in a common belief that individual events within society are not random (hence meaningless) occurrences but parts of larger meaningful patterns that extend through time. Furthermore it is this confidence—that the entire Universe is established upon and governed by a principle of natural and moral order—that enables human beings, individually and collectively, to deal effectively with intellectual, moral, and spiritual life crises (Long 1995, 88).

2. This is also indicated by the fact that the entire Hindu religious system is based on the idea of *dharma*, literally the Great Order, the eternal law of the world. This law of Nature is the guideline of human law and justice, the spiritual principle behind the visible material world that floods the entire Universe, together with cosmic space, with life. *Dharma* is believed to be universal, forming the basis of all the laws of Nature. It is the principle of attraction and repulsion, the control of chemical processes, as well as the law of cause and effect, and logical thinking. From the metabolism of the simplest living beings to the beating of the human heart, *dharma* is the controller of life processes. Similarly, in ancient Chinese philosophy, *qi* 氣, the principle of life, is "the ultimate foundation for the existence of the universe" and the "ontological source of the universe" (Zeng 2011, 100). One of the oldest Chinese books, the *Yijing* 易經, the *Book of Changes*, says the Universe is based on the principle of life (Li 2008, 270).
3. A premise is a previous statement or proposition from which another is inferred or follows as a conclusion (*Oxford English Dictionary*).
4. Physicalism is equivalent to the claim that only physical causes exist. This claim rejects the existence of biological and mental causes (Kim 1993). This is contrary to our everyday experience that we can act according to our will. About the rebuttal of this claim see also Griffin (1998).
5. Today's dominant materialism is physicalism; it is defined fundamentally by the assumption claiming "the causal closure of the physical domain" (Kim 1993, 280), in accordance with "the claim that the world is fundamentally a physical world governed by physical law" (Kim 1993, xv). I use the term 'materialist' in the sense of 'matter-principled,' that is, the erroneous view that takes physics, the science of inanimate matter, to be the one and only fundamental science of Nature. The cornerstone of this matter-principled physicalist worldview is the assumption claiming that only one type of cause exists in the Universe, the physical ones.
6. Idealist worldviews assume that Reality is based most fundamentally on consciousness.

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