Process-Philosophical Perspectives on Biology

Process-Philosophical Perspectives on Biology:

Intuiting Life

Edited by
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and Arthur Araujo

Cambridge Scholars Publishing

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Series: European Studies in Process Thought

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This book first published 2023

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN (10): 1-5275-0450-6
ISBN (13): 978-1-5275-0450-9

In memoriam of Gernot G. Falkner (1941–2022), intrepid pioneer of a new organismic biology and true process thinker.

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NOTE ON COVER IMAGE

How the painting "Fate of the Animals" captures the spirit of the present book.

"Fate of the Animals" ("Tierschicksale") was created in 1913 by the German Expressionist painter Franz Marc (1880–1916). Together with Wassily Kandinsky, he founded the artist movement "Der blaue Reiter" ("The Blue Rider") of which "Fate of the Animals" is a characteristic representative. Unlike other paintings by Marc, which depict animals with a peaceful disposition in an intact nature, the animals in this painting are placed in an apocalyptic context. A forest bursting into flames is depicted, with a blue deer in the centre of the canvas holding its head up as if lamenting, two red boars on the lower left and two green horses on the upper left awaiting their tragic fate. Only the four hard-to-identify animals on the right of the picture—probably deer, foxes, or wolves—appear to be safe for the time being. The lack of horizontal and vertical lines is distinctive for this painting. It contains only diagonal lines, which, along with the deep colours, create tension. This tension is further intensified by the deer's position in conformity with the diagonals. Most of the red diagonal lines scattered across the canvas look like giant flames. The painting foreshadows the suffering that befell humanity as a result of the First World War, a war in which Marc himself lost his life.

The picture's message is even more relevant today than it was then, when it primarily predicted the fate of Europe, the main theatre of the First World War. Because one hundred and ten years after its creation, "The Fate of the Animals" can be experienced as an apocalyptic vision of the impending annihilation of animal and plant life on our planet, which seems to be becoming the inevitable fate of Earth due to massive human short-sightedness and greed. Even if ecological ethics is not an explicit subject of this anthology, our book is deeply rooted in concern for the fate of our biosphere: The thoughts and intuitions developed here by all the authors serve to overcome the scientific-technocratic view of life that is so powerful today, a view which reduces living beings to pure objects of economic interests and mega-technical projects that can only make their and our extermination more inevitable.

The denial of the degradation of living beings to mere objects professed in this book is rooted in the same intuitions as the spirit of "Fate of the Animals". In Marc's paintings there is a recurring symbolism of colours and animals. Deer have a sacred meaning, blue represents severity and spirituality, yellow represents sensuality and gentleness, and red represents matter and its inherent heaviness and brutality. Since green emerges from blue and yellow, the virtues symbolized by both elementary colours can be ascribed to the horses depicted in green. Marc's artistic intuition emphasizes the *value* and *dignity* of animals that the biophilosophical intuitions from which this book originated grant to all living beings.

We also see a third parallel between Marc's experience and portrayal of living nature and the philosophical intuition that forms the basis of our book, as testified by its subtitle *Intuiting Life*. The depiction of the animals and their movement in "Fate of the Animals" is the manifestation of a way to elucidate the essence of animals that slowly matured in several of Marc's earlier paintings through his special expression of animal form and movement dynamics. In this painting, the visualization of the complex and dramatic inwardness of the deer and the horses, fed by deep artistic intuition, is achieved precisely by means of the high abstraction in the reproduction of their form and dynamics of movement. An equally perfect marriage of intuition and abstraction should also be the goal of philosophical intuition. However, this can only succeed if philosophical reflection gradually develops abstractions through intense mental effort attuned to intuitive understanding of its subject, as explained in the introduction to this volume. The development of great artists also reveals something similar. Marc's work is characteristic of the slow and laborious maturation of the artist's intuitive gaze, which unfolds through an equally laborious and slow maturation of the abstract rendering of form and processuality. The philosophical intuition thus shares an essential commonality with the artistic intuition of such a ground-breaking painter: Both mature slowly through the arduous and incessant struggle with symbolic forms—philosophers wrestle with the language and different discourses, artists with the dominant forms of expression of their time.

The editors

ACKNOWLEDGMENTS

As this book is being published in a language that is not our native tongue, we are very grateful to our colleagues Dr. Timothy E. Eastman, Dr. Matthew D. Segall, and Dr. Jeremy Sherman for their editorial assistance and for their advice on scientific and philosophical questions. Our sincere thanks also go to our formatting reviewer Elaine Cristina Borges de Souza, M. A., for her valuable help.

INTRODUCTION

PHILOSOPHICAL INTUITION AND THE UNDERSTANDING OF LIFE: A WHITEHEADIAN AND BERGSONIAN APPROACH*

SPYRIDON A. KOUTROUFINIS

The authors of this book unfold ideas that contrast markedly with the metaphysical foundations of the contemporary life sciences and the academically established philosophy of biology that is closely related to them. Many bio-scientists implicitly or explicitly embrace a materialistic metaphysics that emerged from the worldview of the 19th century. This kind of reductionist metaphysics obscures the complexity of biological phenomena, thereby neglecting essential characteristics of living processes. This book introduces a process-philosophical approach to essential dimensions of the phenomenon of life with the aim of opening up new horizons in our understanding of fundamental biological concepts such as organism, ontogeny, agency, teleology, environment or Umwelt, and normativity. Based on the metaphysics of Alfred North Whitehead and other process thinkers, the authors ascribe subjectivity, value, and teleological striving to all living beings, from the most primitive unicellular organisms to complex animals.

As the subtitle of the present book suggests, the thoughts introduced by the authors are rooted in intuitions about the nature of living beings and life in general. Many scientists and philosophers would be tempted to trace the aforementioned distance between the established discourses of the life sciences and the views presented here to the intuitive roots of the latter. However, this assumption would confirm the all too often asserted antagonism between intuition and analytical-discursive thinking. It is true,

* My sincere thanks go to Dr. Jeremy Sherman and to Professor Arthur Araujo for their valuable contribution to improving this introduction.

as will become clear in the next few pages, that this notion pervades the history of Occidental philosophy. But it is challenged by process-philosophy, which serves as this book's main metaphysical foundation. The core ideas, on which this school of thought is based, are the result of the cross-fertilization of intuitive and analytical-discursive thinking.

This book is based explicitly and implicitly on intuitions influential in process philosophy. The authors introduce ideas based on intuitive thoughts that play an important role in the works of Whitehead and Bergson. Whitehead is mentioned very often in this book, Bergson much less. Nevertheless, I believe that Bergson's fundamental metaphysical intuitions and his understanding of both the nature of philosophical intuition and its relation to abstract thinking can help the reader to place the biophilosophical ideas presented in this volume in a broad and, above all, forward-looking context, whose fruitfulness today can only be guessed at. For this reason, along with the intuitions essential to Whitehead's metaphysics, Bergson's understanding of the nature of intuition is given due attention in this introduction. This is also advisable because, as we shall see, Bergson created a close connection between intuitive thinking and the philosophy of life.

The revolutionary potential and the range of both process-philosophical intuitions and process-philosophical understanding of the nature of intuition and its relationship to scientific thinking only becomes visible against the background of the long history of the concept of intuition in Occidental philosophy. Therefore, a brief historical review is provided first. The second section of the introduction consists of three parts. In the first part, I give an overview of the basic intuitions in Henri Bergson's metaphysics, his understanding of the nature of intuition, and the role he ascribes to philosophical intuition in the study of life. The second part deals with fundamental philosophical intuitions, on which Alfred N. Whitehead's metaphysics and understanding of life are based. In the third part, the essential differences between the understanding of intuition in the works of Bergson and Whitehead on the one hand and in the history of Occidental philosophy on the other are presented. Finally, in the third section of the introduction I present the main ideas of the ten chapters of this volume, with an emphasis on the process-philosophical intuitions, from which the thoughts of the authors develop.

1. The distinction between intuitive and discursive-analytic cognition and knowledge in Occidental philosophy

In the history of Occidental philosophy, a sharp distinction between intuitive and discursive-analytical knowledge can be identified since antiquity, which led to the conviction that there are two essentially different forms of knowledge. In Epicureanism and other ancient philosophical traditions, the Greek term 'epibole' denotes intuitive cognition (Bailey 1926, 259ff.). In late antiquity, the term 'epibole' was contrasted with the antonym 'discursive thinking' (diexodikos logos). A detailed description of this relationship would go beyond the scope of this introduction, which is why we must limit ourselves here to a brief description of the meaning of these contrasting terms in Western thought.

1.1. On discursive-analytic cognition and knowledge

The discursive-analytical type of knowledge progresses through the use of general concepts (universals), which are abstract entities.[1] From such general concepts, linguistic and other symbols are created, which can be combined to form complex expressions according to the rules of scientific, philosophical or other discourses. Such combination occurs gradually through successive stages and in prescribed methodological ways underlying, for example, logical inference[2] and all kinds of scientific proofs.[3]

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[1] Some of the scholars who explicitly hold this position are the following: In the High Middle Ages, John Duns Scotus (1265/66–1308), contrasted intuitive and abstract knowledge, and emphasized the dependence of the latter on the mediation of general concepts (species) that represent present or absent objects (*Ordinatio* II, d.9, q.2, n.19). In *Ethics. Proved in Geometrical Order* [Eth.] Benedict de Spinoza or Baruch Spinoza (1632–1677) highlights the dependence of rational knowledge on general concepts and the correct knowledge of the properties of things (Eth. II, prop. 40, schol. 2). For Arthur Schopenhauer (1788–1860), who considers the "opposition" between analytical and intuitive knowledge to be a "fundamental feature" of his philosophy (Schopenhauer 1958, 88), reason, which distinguishes humans from all animals, consists in the ability, to use concepts. For Friedrich Nietzsche (1844–1900) too, reason is a "type of thinking […] that is accomplished in concepts and logical combinations" (Nietzsche 1962, 52).

[2] In *Summa Theologica* [Summa] Thomas Aquinas (1225–1274) describes the gradual progress of analytical thought by claiming that "reason knows by a process of discursion from one thing to another" (first part, question 59, article 1). The Aristotle interpreter Ammonius Hermiae is one of the first scholars to emphasize

Within a scientific discourse, general concepts and their corresponding symbols of different kinds are used: They denote either (1) the nature of real or abstract entities (e.g. electron, vector), or (2) their properties (e.g. mass, electric charge, spin), or (3) operations performed on the corresponding entities in a particular academic discipline (e.g. mathematical operations), or (4) relationships between these entities (e.g. the mathematical equals sign). Many of these universal concepts (especially the types 1 and 2) are derived from experiences gained through observations or experiments carried out with the methods of the respective discipline.

In contemporary scientific disciplines most symbols represent entities, properties, operations, and relationships that are neither sensually experienceable nor imaginable.[4] Mental operations, the rules of which are determined by a particular discourse, create new abstract symbols from the combination of such symbols, which represent other, usually also unimaginable entities, such as enormously large numbers, high-dimensional mathematical spaces, and astronomical objects that are not directly observable.[5]

The ability of discursive-analytic reason to operate symbolically has often led to the judgment that it is superior to the intuitive approach to reality.[6] Another essential characteristic of discursive-analytical knowledge

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that the discursive cognitive faculty, which he calls "dianoetike," is the only one that proceeds inferentially (syllogizesthai) (In Anal. pr. 24, 31–35).

[3] According to John Locke (1632–1704), when the relationships of complex ideas to one another cannot be carried out intuitively, another mode of knowledge is required, an analytical one, which Locke called "demonstration." It is a painstakingly constructed analysis that examines agreement or disagreement between complex ideas using "intervening ideas" called "proofs" (*An Essay Concerning Human Understanding* [Essay] IV, 2, §3).

[4] While, for example, the multiplication 2x2 is easy to imagine, an operation of the type $(27/6)^9$ lacks any vividness and can only be carried out according to abstract rules.

[5] According to Gottfried Wilhelm Leibniz (1646–1716) "for the most part we have only symbolic knowledge of composite notions" (quoted in: Heidegger 1984, 63f.). If an entity cannot be sensed or imagined, but can only be thought of abstractly through a sign or a word such as 'chiliagon' (a polygon with a thousand sites), Leibniz speaks of blind symbolic knowledge (1880, 423).

[6] The influential 18th century German-Jewish philosopher Salomon Maimon (1753–1800) is a typical example of a thinker who holds this view. He concluded that symbolic knowledge is superior to intuitive knowledge because "by means of symbolic cognition we attain cognition of what is absent and even of what is the furthest away of all, to infinity" (Maimon 2010, 139). For Moritz Schlick (1882–1936), the founding father of logical positivism and the Vienna Circle, knowledge is always inevitably linked to abstract concepts: "so long as an object is not

that led to this judgment is its, at least assumed, general validity or universality.[7] The abstract knowledge generated by discursive reason is seen as knowledge about universal truths that can be abstracted from concrete experiential facts. Since antiquity it has become a necessary condition for knowing the essence of a concrete individual thing (particular) that it (the individual thing) be predicated by at least one general concept (universal). The American philosopher Filmer S. C. Northrop (1893–1992) aptly summed up the importance of the concentration of Occidental philosophy and science on abstract concepts and symbols for the Western understanding of knowledge:

> [T]he Western type of knowledge tends to be formally and doctrinally expressed in logically developed, scientific and philosophical treatises. […] the West tends continuously to be [concerned], with the factor in the nature of things which is not immediately apprehended, but is instead merely suggested as a possible hypothesis by the immediately apprehended (Northrop 1946, 315f.; addition by S.K.).

However, it would be a great mistake if the epistemology of Occidental philosophy were to be limited to the discursive-analytical forms of cognition and knowledge.

1.2. On intuitive cognition and knowledge

The intuitive form of cognition and knowledge has been the subject of Occidental philosophy since antiquity. In everyday language, the term 'intuition,' derived from the Latin verb 'intueri' (to consider), describes the ability to gain insights into a wide variety of facts without the discursive use of reason, that is, without conscious conclusions mediated by concepts. This widespread understanding of intuition as a cognitive faculty without recourse to conscious thought has also greatly influenced the philosophical consideration of this idea. However, this did not prevent

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compared with anything, is not incorporated in some way into a conceptual system, just so long is it not known" (Schlick 1974, 82f.). Since "[i]n the case of intuition […] we do not put two objects into relation with one another; we confront just one object, the one intuited," Schlick concludes that "[i]ntuitive knowledge is a *contradictio in adjecto*. […] We understand and explain nothing through intuition" (ibid.).

[7] The Italian philosopher Benedetto Croce (1866–1951), who has significant insights into the nature of intuitive knowledge, sees the main characteristic of discursive-analytic reason in the fact that it strives for "knowledge of the universal" (Croce 1909, 1).

all philosophers from seeing intuition as compatible in principle with conceptual thinking—which, as we shall see, is particularly true of process-philosophy.

Throughout the history of Western philosophy, intuition has been credited with the ability to grasp its object suddenly, instantaneously, and directly.[8] This contrasts with discursive knowledge, which arises slowly and step by step.

According to some eminent philosophers, intuitive cognition can only be mediated through the senses. Intuition is then reduced to an exclusively sensually mediated activity, which recognizes the nature of objects, their features, and some of the relationships between them (for example equality, likeness, or inequality) only if it is dealing with physically existing things presented to the senses.[9] The narrow connection of intuitive acts with sensual perception corresponds with the belief of some thinkers that the sensual intuition of physical objects is an essential cognitive skill that does not need to be practiced as it is an innate biological ability that not only humans but also animals have.[10] From this perspective, the intuitive act appears as an automatic, spontaneous, immediate, and effortless cognitive process that produces pure evidence. This understanding of intuition contrasts with that of thinkers who acknowledge the existence of another form of intuition that does not require the presence of physical objects, as it can be conveyed through thinking, imagination, and experiencing one's

[8] This position is found, for example, in the works of Themistius (317–388) (In de An. 30, 24–33), Philoponus (490–570) (In Anal. post. 48, 14f.), Aquinas (Summa, first part of the second part, question 57, article 2), Locke (Essay IV, 2, §1), Leibniz (1880, 423), Friedrich Wilhelm Joseph Schelling (1775–1854) (1978, 27) and the German philosopher Eduard von Hartmann (1842–1906) (1884b, 76; 1884a, 313).

[9] This opinion was expressed in the 13th century by Duns Scotus (1265/66–1308) in his work *God and Creatures. The Quodlibetal Questions* [Quodl.] (q. 6, n. 8; q. 13, n. 10; q. 14, n. 10) and in the 18th century by Maimon (2010, 139). Schopenhauer also takes a similar position (1969, 6 [§3], 53 [§12]). In his *Critique of Pure Reason* [CPR], Kant (1724–1804) limits the meaning of the term 'intuition' (Anschauung) to information provided through sensual experience (CPR B 307–308). The close connection of intuition to sensually conveyed information about physically existing things was also supported by other occidental thinkers.

[10] This view is clearly championed by Schopenhauer, since he ascribes intuitive recognition not only to humans but also to animals (1969, 21–23 [§6]). In his essay "Mysticism and Logic" Bertrand Russell (1872–1971) considers intuition as an aspect and development of instinct that humans have inherited from remote generations of animal and their semi-human ancestors (1919, 17, see also: 12f.). Schlick assumes that animals intuit the world in a more complete way than we do because their senses are sharper and more alert than ours (1974, 83).

own consciousness.[11]

Regardless of whether intuitively known things are conveyed to the mind through sensory perception, thought, or imaginative action, some of the most influential thinkers in the history of Western philosophy share the following belief: The contents provided by intuition are the simplest and most indisputable elements from which knowledge can emerge.[12] Starting from this position, many philosophers since late antiquity have come to the conclusion that intuition is an infallible mental faculty[13]—a judgment

[11] According to the methodology of René Descartes (1596–1650), exposed in his *Rules for the Direction of Natural Intelligence* [Rul.], analytical thinking allows a problem to be broken down into simpler separate logical parts in order to arrive at the simplest elements. The objects of intuition are the ultimate elements of such analyses. Descartes asserts that these "few pure and simple natures" can be intuited independently of any others "in experiences themselves or by means of some light situated in us" (Rul. 6, §6). By 'intuition' Descartes understands "the conceptual act of the pure and attentive mind, which conceptual act springs from the light of reason alone" (Rul. 3, §5). Through the inner experience of their own self, rational beings can mentally intuit that they exist and think (ibid.). In his Transcendental Philosophy, the founder of phenomenology Edmund Husserl (1859–1938) attributes to intuition above all the "pure seeing of essence" (reine Wesensschauung) (1976, 539). Transcendental Philosophy is primarily and necessarily a priori philosophy and only secondarily related to factual things (2019, 143). The intuition of essence is not limited to the sense perception of an external fact, but it can also be "a mere—but mere—imagination" (1965, 112). It is obvious that such intuition, since it is not rooted in perception, does not concern anything physically present (ibid.). According to Croce, intuition conveys knowledge about specific things that can be physically perceived or mentally imagined; in other words, an intuitive act can also have an imaginary content that has nothing common with physical reality (1909, 5f.). The work *The Metamorphosis of Plants* (Goethe 2009), which is of central importance in the scientific writings of Johann Wolfgang von Goethe (1749–1832), is based on Goethe's ability to imaginatively visualize the transformation (metamorphosis) of the forms of living beings or their organs as a continuous physical process (Bortoft 1998, 44–48).

[12] To name a few representatives of this position: Descartes (Rul. 3, §5), Spinoza (Eth. II, prop. 40, schol. 2; prop. 41; prop. 42), Locke (Essay IV, 2, §1), Leibniz (1880, 423; 1882, 343), David Hume (1711–1776) (Treatise I, 3, 1), Maimon (2010, 139).

[13] The infallibility of intuition is represented, for example, by Themistius (In de An. 30, 24–33), Philoponus (In Anal. pr. 1, 23), Aquinas (Summa, second part of the second part, question 180, article 6), Descartes (Rul. 3, §5), Spinoza (Eth. II, prop. 41, prop. 42), Locke (Essay IV, 2, §1), and the Polish phenomenologist and Husserl's disciple Roman Ingarden (1893–1970) (1921, 564).

that has not gone unchallenged.[14]

In some of his works, Friedrich Nietzsche elevates intuition to a central means of philosophical progress and contrasts it with the "calculating reason" of abstract and discursive scientific thought. This applies in particular to his book *Philosophy in the Tragic Age of the Greeks*, written around 1873, where Nietzsche claims that "[p]hilosophy leaps ahead on tiny toeholds; hope and intuition (Ahnung) lend wings to its feet […] its feet are propelled by […] the power of creative imagination" (1962, 40). In contrast, "[c]alculating reason lumbers heavily behind, looking for better footholds, for reason too wants to reach that alluring goal which its divine comrade has long since reached" (ibid.). Nietzsche considers Heraclitus to be the intuition-inspired thinker par excellence, since "each word of Heraclitus expresses the pride and the majesty of truth, but of truth grasped in intuitions rather than attained by the rope ladder of logic" (ibid. 69). Nietzsche's worship of the Heraclitean spirit in the intuitive mode of knowledge shows a striking parallel to ideas expressed by the German philosopher Eduard von Hartmann (1842–1906) a few years later. From his insights about the intrinsic connection between intuition and the unconscious von Hartmann concludes that "the discursive or deductive method is only the lame walking on stilts of conscious logic, whilst rational intuition is the Pegasus flight of the Unconscious, which carries in a moment from earth to heaven" (1884a, 316). From this point of view, "[t]he whole of mathematics appears […] as the tools and implements of our poor mind, which, obliged laboriously to heap stone on stone, yet can never touch the heavens with its hand, although it build beyond the clouds" (ibid.). Nietzsche and von Hartmann parallelize the relationship between intuition and discursive thinking on the one hand and the

[14] The belief in the infallibility of intuition has not gone unchallenged, as the following examples show: Russell, who considers intuition as "an aspect and development of instinct" (1919, 17, see also: 12f.), states that "[i]nstinct, like all human faculties, is liable to error" (ibid. 13). The German philosopher Hans Albert (born 1921), who is strongly influenced by Critical Rationalism, sees a close connection between intuition and habit, especially habits of thought, which, however, have often been falsified by scientific progress (1985, 33f.). Goethe's negation of the infallibility of intuitively gained knowledge is particularly noteworthy, since intuition is an essential source of knowledge in his unorthodox science. Starting from Goethe's "intuitive perception of [an] eternally creative nature," one easily comes to the conclusion that "creative processes" constitute the essence of the physical world (2009, 112; addition by S.K.). Thoroughly thought through, this means that the essence of physical reality is subject to permanent transformation, which means that there can be no certain and ultimate knowledge of that reality, no matter how obtained.

relationship between philosophy and science on the other. This parallel, which is itself a product of intuitive thinking, holds enormous potential, especially for contemporary philosophy of life. In the present volume biological questions are considered and dealt with in a light similar to that in which both philosophers place the relationship between discursive-analytical knowledge and intuition.

2. Philosophical intuition and process-metaphysics

The transfer of the tension between intuition and discursive-analytical rationality to the relationship between philosophy and science, which is suggested by Nietzsche and von Hartmann, does not apply to all forms of contemporary philosophizing. However, their poetic reference to the intrinsic relationship between philosophy and intuition is of the utmost importance for a *critical philosophy of science* that is so urgently needed at the present time. I understand this term to mean a philosophical reflection on scientific knowledge that is not content with reformulating scientific statements into philosophical language-games. Rather, critical philosophy of science sees its primary task in pointing out the generally implicit metaphysical presuppositions of the scientific establishment and, if necessary, in proposing alternatives to them. In contemporary biology, the discursive-analytical approach to reality manifests itself primarily through explanations using so-called *mechanisms*. Its philosophical equivalent is the New Mechanical Philosophy, as we shall see. This book is based on the conviction that a special form of intuition, which may be called *philosophical intuition*, is best suited to showing the narrow limits of neo-mechanistic approaches to the phenomenon of life and, moreover, to opening up ways out of the dead ends of this and other reductionist ways of thinking in life sciences.

For this reason, we shall now turn our attention to the idea of philosophical intuition. As we shall see, important foundations of Henri Bergson's and Alfred N. Whitehead's process-metaphysics are rooted in intuitive philosophizing.

2.1. The conception of intuition in the metaphysics of Henri Bergson

Alongside Nietzsche, Henri-Louis Bergson (1859–1941) is one of the most important representatives of the Philosophy of Life or Lebensphilosophie. The combination of philosophy and intuition typical of this mode of philosophizing, as well as the tension between philosophy and science,

also runs through Bergson's work. At the same time, he is one of the most influential process-philosophers whose work was an important source of inspiration for Whitehead's ontology, for the interpretation of which it still offers interesting perspectives today. One of the pillars of Bergson's thinking is his understanding of intuition, presented in some of his major works. It has significant new aspects compared to Occidental tradition and is of particular relevance to the non-reductionist philosophy of the living. Bergson assumes that at the beginning of every philosopher's thinking there is an "original intuition," a basic idea that the philosopher repeatedly gives new expression to (Bergson 1946, 127f.). The philosopher is forced to continuously give new expressions to his or her intuition because it belongs to the nature of intuition that it cannot be given a definitive expression with the symbolic means of language and the abstractions of thought.

The main idea, on which all of Bergson's metaphysics rests, is the idea of *duration* (durée), by which he understands a form of temporality that can only be revealed to the thinker who critically examines the scientific abstractions of the nature of time as well as the practical conception of time in everyday life. Both scientific and practical thought apply to time the same mathematical and other abstractions, with which they treat one-dimensional space; they therefore regard time as a homogeneous continuum. The homogeneity of geometrical or arithmetic continua consists in their conception as sets of parts that share the same quality, allowing mathematical operations between them, such as addition and subtraction. But, Bergson argues, human mind, which attentively experiences its own becoming free of abstract ideas, reveals to us the nature of *pure* time or *duration* (durée), which cannot be abstracted from the experiencing subject, for it *is* its stream of experience:

> Pure duration is the form which the succession of our conscious states assumes when our ego lets itself live, when it refrains from separating its present state from its former states. […] in recalling these states, it does not set them alongside its actual state as one point along side another, but forms both the past and the present states into an organic whole, as happens when we recall the notes of a tune, melting, so to speak, into one another. […] In a word, pure duration might well be nothing but a succession of qualitative changes, which melt into and permeate one another, without precise outlines, without any tendency to externalize themselves in relation to one another, without any affiliation with number: it would be pure heterogeneity (Bergson 2001, 100–104).

When Bergson states that "an absolute inner knowledge of the duration of the self through the self is possible" (1946, 199), he makes clear that

duration can only be experienced through direct inner perception of one's stream of consciousness (self-perception), in other words, that it can only be experienced intuitively. The "pure heterogeneity" of the duration stands in stark contrast to the homogeneity of the continua accessible to mathematical operations. Rather than sharing the same quality as the successive elements of mathematical or other abstract continua do, the elements of duration permeate one another in a way that allows them to create their own quality or essence: Pure duration is "nothing but a succession of qualitative changes" (last quote). "[D]uration is the state of completing itself" (Bergson 1946, 194) through "its continual changing of quality" (ibid. 211), which duration effects through its own unfolding. The becoming of duration is an ongoing transformation and redetermination of its own essence. The Bergsonian duration is a *process* in the strongest process-metaphysical sense of the term: through its own unfolding, duration continually redetermines the *law* of its own becoming. Needless to say, the creative self-transformation of duration cannot be described by any abstract mechanism dominating contemporary natural sciences, especially bio- and neuroscience (Koutroufinis (in this book: sections 4.1 and 4.4); 2022, 10–16; 2017, 31–37).

Having introduced duration as the central intuitive idea underlying all of Bergson's work, it is time to consider his understanding of the term 'intuition' in general, which will also connect us with another central intuition of his metaphysics (see below: point viii). I distinguish the following aspects of Bergson's theory of intuition:

i) Distinction without antithesis between intuition and discursive-analytic rationality.

Bergson distinguishes between intuition and discursive-analytic thought. This is evident from his essays "An Introduction to Metaphysics" and "Philosophical Intuition," published in 1903 and 1911 respectively (Bergson 1946, 128f., 187). Intuition allows the subject to coincide with what is unique and consequently ineffable in its object (ibid. 190). In contrast, analysis, which operates with abstractions and linguistic symbols, reduces the object to already known general elements that are common to it and to others, "expressing [thus] a thing in terms of what is not it" (ibid., addition by S.K.). So, the first impression is that Bergson agrees with the traditional separation between intuitive and analytical knowledge. This impression is correct, but it must not be interpreted in the sense of an antagonism between the two cognitive faculties. For, as we shall see below, in various works Bergson refers to a philosophical form of intuition that requires intensive intellectual work on the abstract concepts that

prevail in scientific and other discourses.

ii) Intuition as a form of sympathy.
The intuiting subject enters into its object through a form of *sympathy* that presupposes that the object is ascribed inwardness and thus a certain subjectivity:

> I attribute to the [object] an inner being and, as it were, states of soul; it also means that I am in harmony with these states and enter into them by an effort of imagination (ibid. 187, addition by S.K.).

The attribution of interiority independent of the nature of the object is not meant metaphorically, for it rests on a core idea of Bergson's metaphysics, presented below (see point viii). Bergson often cites the example of the artist, who intuitively overcomes the distance that space puts up between him and his model and empathizes with the object (Bergson 2023, 159f.). Of course, the concept of duration, which underlies all of Bergson's works, lives from the conviction that the subject can only experience its own duration through sympathy with itself (Bergson 1946, 191f.).

iii) Intuition is not limited to physically present beings.
Another important aspect of Bergson's theory of intuition is that the subject cannot only sympathize with actually existing physical objects, like the artist who depicts a model. Bergson claims that intuition enables the subject to empathize with even imaginary beings like a fictional character in a novel (ibid. 188). In other words, intuitions are conveyed not only through sense perceptions, but also through other mental abilities such as imagination and thought.

iv) Intuition can convey knowledge about universal facts.
An even more important aspect of Bergson's understanding of intuition is that intuitive sympathy is not limited to grasping single entities, existing or imaginary:

> [A]esthetic intuition (like external perception) only attains what is individual. But we can imagine an inquiry oriented in the same direction as art that would take *life in general* as its object, the way that physics, by following to its end the direction marked out by external perception, extends individual facts into *general laws* (Bergson 2023, 160; italics added).

Bergson thus ascribes to intuition the ability to also recognize universal facts that regulate the connection between many individual beings. This

aspect of Bergson's theory of intuition is of great biophilosophical relevance because, with reference to biology, it ascribes intuitive knowledge the ability to embrace essential universal properties of the phenomenon of life.

v) Philosophical intuition questions habits of thought.
"Intuition, if it is possible, is a simple act" (Bergson 1946, 191). This in no way means that acts of intuition occur spontaneously and unfold automatically. Even when all the conditions are met for consciousness to operate intuitively, it must make a final necessary effort of its own in order to arrive at intuitive cognition (ibid. 195). The intuitive act often begins with a refusal to follow commonly accepted ideas that are taken for granted:

> It seems to me that intuition often behaves in speculative matters like the demon of Socrates in practical life; […]: it forbids. Faced with currently-accepted ideas, theses which seemed evident, affirmations which had up to that time passed as scientific, it whispers into the philosopher's ear the word: *Impossible!* […] What a strange force this intuitive power of negation is! (ibid. 129, italics in original)

A key feature of Bergson's critique of modern rationality stems from his pragmatist belief that scientific thought resembles everyday life in one particularly important respect: Both the unquestioned habits of everyday thinking and some of the deep-seated modes of thought that dominate various scientific discourses are unconsciously rooted in our utilitarian approach to reality. The latter, however, conceals the complexity of being in order to show ways of its practical and technological manipulation. It is therefore an important task of the philosopher "to start up a certain effort which the utilitarian efforts of everyday life tend, in most men to discourage" (ibid. 195). Bergson thus distances himself from an understanding of intuition as habit. This aspect of his theory of intuition shows that Bergson is primarily concerned with a philosophical form of intuition, which is also underlined by his reference to the Socratic demon.

vi) Philosophical intuition creates fluid concepts.
Bergson's belief that intuition, especially when it acts philosophically, must break with comfortable habits of thought corresponds to his conviction that metaphysics must not be a "game of ideas" (ibid. 198). Of course, the metaphysician cannot operate without concepts, but she has to create fluid concepts:

> [Metaphysics] is strictly itself only when […] it frees itself of the inflexible and ready-made concepts and creates others *very different* from those we usually handle, I mean flexible, mobile, almost fluid representations, always ready to mould themselves on the fleeting forms of intuition (ibid., italics added, addition by S.K.).

This means, however, that the metaphysician cannot have the concepts available at the beginning of her analysis, with which she will treat a concrete problem. Nor can she define her terms at the beginning of her investigation. The fluid concepts can only be gained through a long, arduous, empathetic, and philosophical examination of the object. Creating new concepts through the long and demanding process of philosophical intuition requires reversing one of the most powerful habits of thought, which is "going from concepts to things, and not from things to concepts" (ibid. 208). For Bergson, "[t]o philosophize means to reverse the normal directions of the workings of thought" (ibid. 224), "to go from reality to concepts and not from concepts to reality" (ibid. 216) because "philosophy should be an effort to go beyond the human state" (ibid. 228).

vii) True empiricism or philosophical intuition as a method of metaphysics.
Metaphysics calls for a "true empiricism" that seeks to embrace the object itself in order to fathom its inner life; "this true empiricism is the real metaphysics" (ibid. 206).

> [A]n empiricism worthy of the name, an empiricism which works only according to measure, […] cuts for the object a concept appropriate to the object alone, a concept one can barely say is still a concept, since it applies only to that one thing (ibid. 207).

Bergson's true empiricism does not call for the emergence of new modes of perception, for example, through altered states of consciousness. True empiricism does not spring automatically from such states of consciousness. It inevitably requires hard and time-consuming intellectual work, which consists in creating concepts that can be adapted to the object in question. The intuitive activity, in which all true empiricism is rooted, is a method of philosophy and not spontaneous inspiration. Intuition is a method of thinking and can by no means be practiced by introspection alone (ibid. 217). In Deleuze's words:

> *Intuition* is the method of Bergsonism. Intuition is neither a feeling, an inspiration, nor a disorderly sympathy, but a fully developed method, one of the most fully developed methods in philosophy (Deleuze 1991, 13).

viii) Intuition can reveal the continuum of the modes of being.
Along with the idea of duration, another central idea of Bergson's metaphysics pervades his most important works: the existence of a continuum of durations, at both ends of which stand the duration of the supreme being, the "living eternity" as Bergson calls it, and the micro-chronic durations of quantum events. It is possible that "one places oneself directly, by an effort of intuition, in the concrete flowing of duration" (Bergson 1946, 220).

> [T]he intuition of our duration […] puts us in contact with a whole continuity of durations which we should try to follow either downwardly or upwardly […] In the first case, we advance toward a duration more and more scattered, whose palpitations, more rapid than ours, dividing our simple sensations, dilute its quality into quantity: at the limit would be the pure homogeneous, the pure *repetition*, by which we shall define materiality. In advancing in the other direction, we go toward a duration which stretches, tightens, and becomes more and more intensified: at the limit would be eternity. This time not only conceptual eternity, which is an eternity of death, but an eternity of life. It would be a living and consequently still moving eternity where our own duration would find itself like the vibrations in light, and which would be the concretion of all duration as materiality is its dispersion. *Between these two extreme limits moves intuition, and this movement is metaphysics itself* (ibid. 221, italics added).

Since living eternity is a duration, it must be understood as a process of ongoing creation of its own quality endowed with interiority and thus with a form of subjectivity. As the supreme of all durations, from which, as Bergson says in *Creative Evolution*, all other entities emerge (2023, 217f.; Koutroufinis 2019, 359–372), it can be characterized as the duration of the supreme divine being. It has the highest tension of all durations, while the extremely short-lived durations of quantum material events have the lowest tension (Koutroufinis 2019, 365).[15] This picture of the continuous

[15] In this introduction, the *tension* of a duration is understood as the intensity of the becoming of this duration, that is, the creativity with which it transforms its quality and thus (re)determines its own nature (essence). Although it is questionable whether quantum physical events (e.g. manifestations of elementary particles in a detector) determine their own nature even to a small extent, they can be ascribed an elementary duration due to their irreducible indeterminacy. In contrast to inorganic materiality, certain individual characteristics of their constitution and behaviour can be recognized even in the simplest living beings, which can also vary over the course of their lives. From a Bergsonian point of view, these characteristics cannot be exhaustively attributed to material differences, e.g. of genetic or

spectrum of durations is of great metaphysical relevance for it ascribes duration and thus an elementary inwardness even to inorganic processes, such as quantum events, which in contemporary science are considered void of any sentience and phenomenal quality (quale). And of course, as we shall see shortly, this basic Bergsonian intuition is of particular importance to biophilosophy because it enables us to assign duration and thus interiority and an elementary form of subjectivity to all living beings and, if they are multicellular organisms, to their cells (ibid. 378–398). It is evident that the empathetic encounter with modes of being that are extremely remote from one's own duration can only be aspired to and accomplished by beings with speculative interests and not by beings whose entire existence revolves around the satisfaction of biological needs. Therefore, in Bergson's philosophy, intuition must be seen as a purely human ability, the highest form of which is the philosophical mode of intuiting.

ix) Philosophical intuition and the study of life.
In his 1907 published work *Creative Evolution* Bergson unfolds aspects of his notion of intuition that are closely related to the specific processuality of living beings and life in general. Bergson conveys his understanding of the origin and evolution of life through a metaphor based equally on the idea of duration and the continuum of modes of being, which is a continuum of durations of varying intensity or tension:

> Imagine a container full of steam at a high pressure [tension], with some cracks here and there in the walls of the container through which steam is escaping in a jet. The steam shooting out into the air condenses almost entirely into droplets that fall, and this condensing and falling represent simply the loss of something, an interruption, a deficit. But a small part of the jet of steam subsists, uncondensed, for a couple of instants. This steam attempts to lift up the drops that fall; it can at most slow down their fall. In the same way, jets must ceaselessly shoot forth from an immense reservoir of life, where each one, falling back, is a world. The *evolution of living species* within this world represents what subsists of the initial direction of the original jet and of an impulse that continues along in the *inverse direction of materiality* (Bergson 2023, 217; italics added).

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epigenetic nature, and can consequently only be regarded as an expression of a duration, albeit a simple one. Some correlation can also be assumed between an entity's tension and its lifespan as measured by an external observer. While very short-lived entities, such as quantum events, definitely have very low tension, it should not be assumed that a tree living for thousands of years has a higher tension than a human or mammal. A longer lifespan *can* therefore mean a higher tension, but is neither a necessary nor a sufficient condition for the latter.

The "container full of steam" or "immense reservoir of life" is a metaphorical description of living eternity, which is the duration of the supreme divine being. Living beings and the various forms of inorganic matter are nothing but embodiments of the emanating divine energy. The further they are from their origin, the more solidified 'crystallizations' of the emanating divine energy they are. Bergson's belief in the divine origin of life and all materiality is clearly shown in the following image:

> If the same kind of action is being accomplished everywhere—an action that is sometimes *unmaking* itself and sometimes attempting to remake itself—then I simply express this likely similarity between worlds when I speak of a center from which these worlds would shoot forth, like the sparks shooting out from an immense firework [bouquet], so long as I do not present this center as a thing, but rather as a continuity of shooting forth. *God*, thus defined, has nothing of the ready-made; he is unceasing life, action, and freedom (ibid. 219, italics added).

The negative connotation of the term "unmaking" [défait] points to the loss of the original unlimited freedom and creativity of the emanating divine duration, which crystallizes itself as the different modes of physical reality and thus life. This loss increases as the 'fallen' entities move away from the living eternity. The loss of freedom subjects the emanated beings to various restrictions, which in the case of inorganic matter manifest themselves as mathematically formulatable natural laws. The deterministic objects of classical physics occupy the lowest positions in the continuous spectrum of durations. The quantum physical and biomolecular events are likely to be located somewhat higher.

Bergson's image of the "small part of the jet of steam," which "subsists, uncondensed, for a couple of instants" and "attempts to lift up the drops that fall" says nothing other than that durations of higher tension[16] interact with those of lower and form complex wholes. Since the idea of duration was derived from the intuitive self-awareness of the human stream of consciousness, any non-human entity that is ascribed a duration must also be assigned a mental quality (see point viii). The mental quality of a concrete entity is all the more recognizable the less the supreme duration it contains has removed itself from its divine origin. This mental quality is a duration flowing through more solidified and therefore less creative durations of much lower tension, i.e. through matter. This is asserted by the statement "Life—that is, consciousness launched through matter," which is essential to Bergson's philosophy of life (ibid. 163). Evolution represents the attempt by the mental qualities to gradually free

[16] See footnote 15.

themselves from the constraints of matter and regain their lost freedom (ibid. 216). Each duration tied to organismic materiality had two possibilities. It could either concentrate on its own creative becoming, that is, on its own durational nature, which is the way of intuition,[17] or deal with the nature and laws of organismic matter, it was passing through, which is the way of *intellect*—in Bergson's words:

> In this way, [duration] oriented itself either in the direction of intuition or in the direction of the intellect. […] On the side of intuition, consciousness found itself compressed to such a point by its envelope [i.e. matter] that it had to contract intuition down into instinct, i.e., to embrace only that tiny portion of life that interested it. […] From this side, the horizon was immediately closed off. To the contrary, consciousness establishing itself as intellect, that is, focusing first on matter, seemed in this way to externalize itself in relation to itself; but, precisely because it is adapted to external objects, it is able to circulate among them, to get around the barriers that it encounters, and to increase its domain indefinitely (ibid. 163f., additions by S.K.).

While intuition, restricted by the constraints of matter, shrunk to a purely practical, unconsciously acting instinctual faculty, the intellect unfolded into an instrument of animal life that strives for and achieves ever-greater mastery of matter. The intellect overcomes the constraints of matter through action (ibid. 48), which in the evolution of vertebrates ultimately led to planned actions that require the coordination of many individuals. This not only enabled complex group behaviour, such as the coordinated pack hunt of social animals, but above all the production of tools (ibid. 126f.) that serve to manipulate matter. In human groups, this ability acquired an autocatalytic dynamic, leading to the invention of tools used to create other tools and endless variations on their manufacture, which the term *homo faber* perfectly encapsulates (ibid. 127). The human intellect is able to do this because it has perfected an ability that has remained rudimentary even in the most intelligent animals: to recognize relations (ibid. 137), which can be abstracted from concrete physical (and abstract) relata. The intellect abstracts from the concrete through linguistic symbols in order to grasp general facts—it is in its element when it can operate with linguistic, mathematical, and other general concepts such as adjectives, numbers, mathematical functions, species, and genera. The main tool of the human intellect, then, are the general concepts, through

[17] As said above, consciousness can only experience its own durational nature through immediate empathy with itself, which is an act of intuition mediated by an inner sense.