Philosophy of Mind, Artificial Intelligence and Existentialism

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By

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ACKNOWLEDGEMENTS

Life puts different people on our path.
Each with a purpose.
Some are our teachers,
some are our mentors,
and some are our kindred souls.
Sometimes, however, people are put on our path
to remind us
that we are perfectly fine without them.

I have been fortunate in my life: most people that were put on my path were there with a profoundly positive purpose. These are the people I learned from; they were my mentors. I am immensely grateful to all the kindred souls that have shaped me, encouraged me, and guided me along the path of personal progress. There were many, too many to mention them all here. But I cannot leave out the three most important ones, my mentors in philosophy, Bojan Borstner and Janez Bregant, and especially my soulmate, my wife Metka – had I not met her at exactly the right time and place, I would surely have become someone else, and not the person I am today.

I wish to express my appreciation to Helena Fošnjar for her excellent translation and proofreading work and for all her advice. Last but not least, I want to express my gratitude to all who have ensured the quality of this book and to the publishing house, Cambridge Scholars Publishing, which made it possible for this work to see the light of day.

It would be a waste of words to speak about many others who were also put on my path: my life would have been equally beautiful even if I had never met them.

FOREWORD

Society has found itself at a crossroads again in the last few years. Two key events; the pandemic, and the awareness that there is a new and different kind of intelligence among us (an intelligence in which humans have assumed the role of creator) have marked these last few years and will continue to drastically shape our future. The demands placed on today's society are increasingly vague and at the same time complex; changes are increasingly eruptive and do not give us, the people, much opportunity for reflection, as we were used to until now. If we want society to change according to our wishes, we certainly need a plan and at least rough development guidelines. In this book, we will thus embark on a long path of potential explanations for how this society could remain humane and put man at the center of these changes.

If we only briefly analyze the current situation, we can see that the situation is far from being unambiguous or simple. Today, people encounter entirely new problems that highlight deep ethical and philosophical questions and practical concerns in addition to technological challenges. These concerns stem from the *philosophy of the Other*, which man does not know and cannot say much about. The Other allows for possibilities and presupposes progress but says nothing about the price we will pay for this progress. The book follows Sartre's key motto: *existential questions cannot be answered once and for all, and every period must ask its own philosophical questions.* Pandora's box is open; almost everything has escaped from it; at the very bottom, there is only the *hope* that we will be lucky and that all changes will happen for the benefit of the whole of humanity and not just for the benefit of a few individuals or some other entity. The book is about the existence of humanity in this rapid development. We live in chaotic and absurd times, like the period between the two wars, or the period immediately after the Second World War. And the philosophical response to this chaos and absurdity of social change was existential philosophy.

The aim and the underlying idea of this book is an attempt to adapt existentialism to the needs and goals of modern-day society, in which we are once again in a state of chaos, and the situation in society is becoming similarly absurd as it was after the First World War. There are more and more wars, more and more insecurity, and relations between people are

increasingly incomprehensible. Existentialism 2.0 is presented on philosophically somewhat fewer solid foundations while still anchored in the ontological and phenomenological bases of 20th century existentialism. Relying on dynamic systems theory and dialectic development, the philosophy here is constructed to adapt as much as possible to the space-time and social changes of present-day society.

Thus, the book is divided into eight chapters, to which an Index, a short glossary and, of course, references are added at the end. The construction of the content is based on a historical approach. Thus, in the Introduction, we highlight general theoretical, philosophical, ontological and phenomenological starting points emphasizing human existence. In the second chapter, we then touch on modern society and two entities based on different interpretations of intelligence, i.e. human and artificial intelligence. In the third chapter, which is an introduction to the fundamental discussion about the role of man in modern society, we build the foundations of a new existentialist philosophy, which we call Existentialism 2.0, and which starts from historical foundations that go back to Protagoras, Socrates and continue through Kierkegaard, Hegel, Nietzsche, Sartre and Camus. In the fourth chapter, we focus on the fundamental starting points of existentialism of the 20th century, which we then translate into today's social reality. In Chapter 5, we try to shed light on this society, emphasizing ethical relations, especially the relationship between man and machine, i. e., between man and Artificial Life Forms (ALF). With this, we build the basis for the fundamental part of this book, that is, for chapters 6 and 7, where we touch upon the origin of existentialism and conclude with Existentialism 2.0. A short glossary has been created to make the terminology used in this book less ambiguous, explaining the referenced relationships and the terms used.

It is true that when reading this book loosely, specific sentences, certain claims, or philosophical starting points are repeated, but we must point out that this repetition pursues its purpose. In pedagogical sciences, this is called *reinforcement learning,* because with the number of repetitions, memorization increases, which is a fact known since Antiquity. The same idea is expressed in the proverb: *repetitio est mater studiorum,* and also in *gutta cavat lapidem, non vi sed saape cadencdo.* And precisely because of this, so that the reader could internalize the fundamental starting points, certain thoughts appear several times, but always in some new context.

1. INTRODUCTION

Sartre warns that existential questions cannot be answered once and for all. Philosophical questions are, by definition, questions that generations must continually ask themselves, as this stimulates in us a living sense that we are alive.

Introductory story

We will illustrate human existence with its content and its corresponding relationships. All human existence begins with the incubation phase, as life begins long before itself with some historical memory and genetic code. It transforms into childlike curiosity and the eternal question of *why.* When it always receives unanswered questions or meaningless answers, it transitions into the adolescent phase of awakening, becoming aware of the pointlessness of existence, boredom, and the absence of meaning. If a person accidentally emerges from this absurd situation, they transition into the search for adulthood. The contradictions between Western and Eastern philosophies could illustrate this search. Western philosophy forces a person into constant fleeing, searching for truth, searching for oneself, searching for freedom – interpreting freedom, searching for peace in eternal inner unrest. Eastern philosophy, on the other hand, teaches patience, calming down, waiting for what comes by, discovering, the revelation of truth, (non)freedom, emergence, and questioning whether someone (something) from the outside can judge a personal relationship with oneself, whether external norms can be above individual norms (me and death). Moreover, it concludes in the final phase, the calming of old age, waiting for the inevitable, when a person returns to the question *of why*, the philosophy of *Ouroboros*, the curvature of space and space-time, and back to the inevitability of the end, to the ultimate theatre of the absurd.

ONTOLOGY

Suppose philosophy studies general and fundamental questions about existence, knowledge, values, reasons, mind and language. In that case, metaphysics addresses the study of reality's fundamental nature, including the relationship between mind and matter, substance and attribute, potential and actuality and answers to the question of what is real (Natanson, 1972). Ontology addresses questions about *being* and *becoming*, the study of *being*,

and the concepts of becoming, existence, and reality, symbolically shown in Figure 1_1.

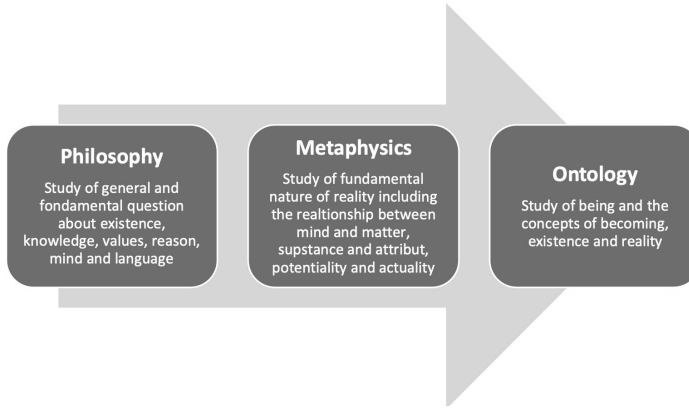

Figure 1_1: Relations in philosophy

Figure 1_1 represents symbolically the development of human self-exploration connected with the ontological development of *existential philosophy*. The description of each component is discussed below in Figure 1_2.

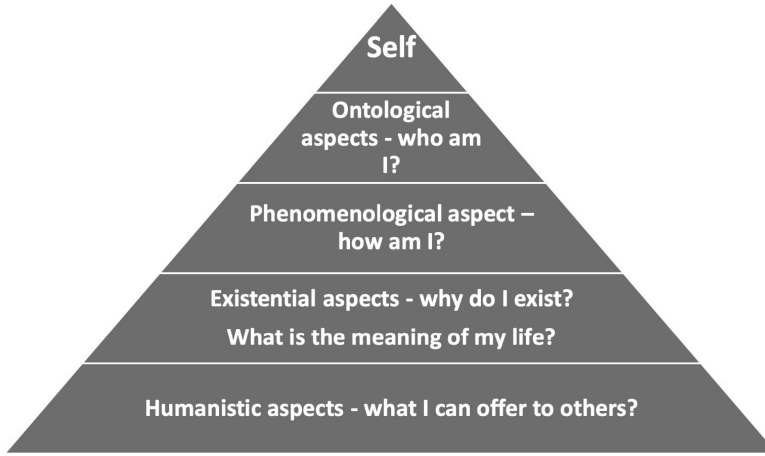

Figure 1_2: Development of an expanded self

Ontological aspect – who am I?

The ontological aspect enables the exploration of the personal sense of "being and becoming" in this world. It allows participants to engage with the philosophical reasoning associated with the meaning of their existence in the given time. Such exploration can be effective in articulating our understanding of purpose and meaning in life. Ontological understanding may be helpful to identify personal resources of hope and connection (Kierkegaard, 2000; Martinsen, 2006).

Phenomenological aspect – how am I?

The phenomenological domain explores humans' perceptions, feelings and experiences in the given situation. It may allow people to understand the process of healing through intentionality. Intentionality has been defined as focused attention or mental projection of awareness, with purpose and efficacy, towards some object or outcome, such as promoting change in oneself or another. Hence, by exploring human thought constructs, affective responses and behavioral reactions, people can develop insights about the feelings and responses developed in a given situation. This can help to explore factors affecting individual coping and resilience in crisis (Martinsen, 2006).

Existential aspect – why do I exist? What is the meaning of my life?

This aspect focuses on one's quest in life. It allows participants to explore what influences their identity constructs, and how it often affects their wellbeing (Kang, 2003). Such exploration can be useful in recognizing the meaning of suffering and hope in one's life. This domain can be highly useful in exploring identity crisis, gender issues, sexual anxieties, social fears and nature of loss and pain, affecting personal growth and recovery (Sartre, 1984; Schilpp, 1981; Silverman and Elliston, 1980).

Humanistic aspect – what can I offer to others?

This domain identifies how the human self is presented to other members of society. It allows humans to explore the extent of self-availability. By exploring the humanistic dimension, humans can recognize their strengths and areas of challenge. Such realization may help them to overcome emotional and behavioral resistance, which hinder the realization of human potentials (Newman, 1999).

Ontological reasoning is particularly suited to developing the philosophical aspect of existentialism 2.0, to create and acknowledge personal ontological space and commitment to availability. Such an ontological approach may serve as the basis for the interpretation of relations within the presented philosophy.

PHENOMENOLOGY

Phenomenology in philosophy is the philosophical study of objectivity – and reality more generally – as subjectively lived and experienced (Smith and Woodruff, 2009). It seeks to investigate the universal features of consciousness while avoiding assumptions about the external world. It aims to describe phenomena as they appear to the subject, and to explore the meaning and significance of the lived experiences. This approach has found many applications in research across different scientific disciplines, especially in the social sciences, humanities, psychology, and cognitive science, but also in fields as diverse as human-computer interaction, among many others. The application of phenomenology in these fields aims to gain a deeper understanding of subjective experience, rather than focusing on behavior (Embree, 1997).

In particular, transcendental phenomenology, as outlined by Edmund Husserl, aims to arrive at an objective understanding of the world via the discovery of universal logical structures in human subjective experience. There are important differences in how different branches of phenomenology approach subjectivity. For example, according to Martin Heidegger, truths are contextually situated and dependent on the historical, cultural, and social context in which they emerge. All these different branches of phenomenology may be seen as representing different philosophies despite sharing the common foundational approach of phenomenological inquiry; that is, investigating things just as they appear, independent of any particular theoretical framework.

Phenomenology stresses the formation of knowledge based on human perception and experiences.

- Subjectivity and discussion of personal sensations, feelings and experiences are seen as meaningful
- Personal individual experiences and perceptions of the world are the only source of knowledge.
- Several variations exist, all emphasizing the physical and bodily experiences of the world in formation of the knowledge.

- You need to be ready and willing to accept and understand new ideas, situations and events.
- You must approach the research topic without any previous presuppositions or predefined ideas and be willing to do the research in a flexible theoretical framework.

EXISTENTIAL PHEMENOLOGY

In *Being and Time*, Martin Heidegger (1927, 2005) reframes Edmund Husserl's phenomenological project (Husserl, 1982/1913) into what he terms fundamental ontology. This is based on an observation and analysis of being-there (German, *Dasein*), the human being, investigating the fundamental structure of the lifeworld (Husserl's term in German, *Lebenswelt*) underlying all so-called regional ontologies of the special sciences. In Heidegger's philosophy, people are thrown into the world in each existent circumstance, but also in the world of future circumstances. Most existentialist phenomenologists were concerned with how we are constituted by our experiences and yet how we are also free in some respect to modify both ourselves and the world in which we live.

Building on Heidegger's language that we are "thrown into the world", Jean-Paul Sartre says that "man is a being whose existence precedes his essence". Both point out that any individual's identity is a matter of the social, historical, political, and economic situation into which he or she is born. This frees phenomenology from needing to find a universal ground to all experience, since it will always be partial and influenced by the philosopher's own situation. In her work *The Second Sex*, Simone de Beauvoir explored how greatly the norms of gender shape the very sense of self that women have, in distinction from men. However, in different ways, all these philosophers also stressed the freedom which humans have to alter their experiences through rebellion, political action, writing, thinking, and being. If we are constituted by the human social world, then it is only humans that created it and can create a new world if they take up this task.

DEVELOPMENT

Sartre synthesized Husserl and Heidegger's ideas. His modifications include his replacement of Husserl's concept, *epoche*, with Heidegger's structure of *being-in-the -world*. His existential phenomenology, which is articulated in his works such as *Being and Nothingness* (Sartre, 1984), is based on the distinction between *being-in-itself* and *being-for-itself* (Embree, 1997; Smith and Woodruff, 2009).

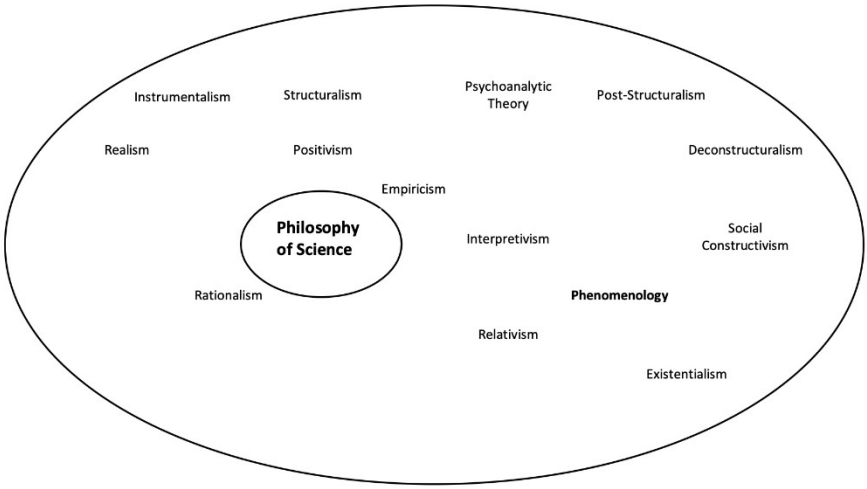

Figure 1_3: Phenomenology of Philosophy of science

SCIENTIFIC REASONING AND ARGUMENTATION

You can ask questions, then you collect information and study it. Eventually, you can form a hypothesis and test it. It is only then that you are perhaps able to say that you are certain.

Findings are confirmed through formally correct argumentation by means of:

- empirical arguments, empirical research,
- statistical argumentation based on actual data processing, through performed methodological research,
- by referring to valid covering laws and theoretical findings, and
- by persuasion.

Science and Thought

Before embarking on an in-depth discussion about the absurd and absurdity, some basic notions need to be defined, and answers need to be provided to the fundamental question of what science is in the first place (Kordigel Aberšek and Aberšek, 2020). *What is science?* This question may be seen from two standpoints, namely:

- **COMMON SENSE**
  Science includes domains from the natural sciences, including physics, chemistry, biology, mathematics, and technology (STEM areas), but not the arts, for example music, or other humanistic domains such as theology.
- **PHILOSOPHY**
  The focus here is on the characteristics and methods of work that are common to all the above-mentioned areas. What determines that something *is science?*

If we want to (and we should) think like scientists, then of course we must consider science from a philosophical point of view. This raises new questions:

- Isn't science just an attempt to understand, explain and predict the world we live in?
- But is that all that science is?

The question of what science is, therefore – like many philosophical questions – is more complex than it appears at first glance. Still, we may be able to reach a kind of consensus, some kind of short answer:

- Science is distinguished by the *special methods* which scientists use to explore the world.
- *Science forms theories.* One of the key questions in the philosophy of science is to understand how techniques such as experimentation, observation, and theorizing have enabled scientists to uncover so many of nature's mysteries.

Science is therefore characterized by a typical way of thinking, i.e., by *scientific thinking.*

Scientific Thinking

Scientists often tell us things about the world that we would never have thought of or believed in, e.g., biologists tell us that we are related to chimpanzees, geologists tell us that Africa and South America were once part of a single landmass, physicists (cosmologists) tell us that the universe is expanding (or contracting?). *But how do scientists arrive at these incredible insights?* The answer, again, seems simple:

By thinking and reasoning!

But what exactly is the nature of scientific thinking? And to what extent can we trust the conclusions of scientists? The easiest way is to start thinking like them, to start using the same or similar methods and ways of reasoning. There are many scientific methods out there, so let us look at just a few of the most commonly used:

- deductive reasoning,
- inductive reasoning,
- inference to the best explanation, and, finally,
- probability.

Logicians make an important distinction between *deductive and inductive* forms of reasoning (Aberšek, Kordigel Aberšek, 2019).

Deductive and Inductive Reasoning

In deductive reasoning, we always proceed from the general to the more specific: if something applies to everyone (general), then it is going to apply to me as well (specific).

On the contrary, *in inductive reasoning,* we proceed from premises about subjects we have already researched (from specific observations), to conclusions about subjects we have not yet researched (broader generalization). In other words, based on the specific (e.g., based on a smaller research sample), we try to draw broader, general conclusions.

Deductive reasoning starts from the general and moves to the particular, while in inductive reasoning we try to in some way conclude from the particular to the general. Deductive thinking is therefore much safer than inductive thinking. In deductive reasoning, we are able to rely on the fact that if we start from true premises, the conclusion will also be true.

Inductive reasoning is just the opposite: it is quite possible that true premises will lead us to a false conclusion. *However, in life we often think inductively. Do scientists also use inductive reasoning?* Although inductive reasoning is not logically sound, it appears to be a perfectly reasonable way of forming beliefs about the world (Aberšek, Kordigel Aberšek, 2019).

EXAMPLE:

The sun has risen every day so far, which means it will also rise tomorrow (and every day in the future).

But what justifies our belief in induction? How should you go about persuading someone who rejects inductive reasoning?

David Hume (2000) pointed out that all inductive arguments (and all scientific theories) are based on the principal uniformity of nature. This is the assumption that things that have been experienced in the past will be repeated in the future. This is circular or inductive argumentation. In all cases, the inductive premise of the reasoning had the form: *all x investigated so far were y,* while the conclusion had the form: *the next x will also be y.* These inferences led us from the investigated cases to the unexplored cases, an inference that is common in science.

Inference to the Best Explanation

The inference is not deductive – the inference is not a consequence of the premise. The inference is reasonable – it offers a better explanation than other explanations – it represents the best way to interpret the available facts: inference to the best explanation (IBE). However, there is a terminological confusion between IBE and induction:

- IBE is inductive reasoning; it refers to any reasoning that is not deductive.
- IBE and induction are different – inductive reasoning is inference from known examples to unknown ones.

It does not matter which type of reasoning one uses; however, one must be consistent!

Argumentation

We can confirm our conclusions, as already mentioned, by means of formally correct argumentation, or by persuasion. Once we have arrived, in some way or another, to certain conclusions, we need to confirm (or reject) these conclusions; we need to provide argumentation. Argumentation tries to take effect on an audience, to change the opinion or atmosphere of the audience, and reach a consensus (a compromise through conversation), and not to enforce an own will by means of coercion or dressage. In science, this is where we use the old maxim: “use the power of argument rather than arguments of power”. To sum up, argumentation is a method of persuasion rather than validation, which is why it is more popular in circles of pseudo-scientists and false prophets, or influencers, as we may call them today (Aberšek, Kordigel Aberšek, 2019).

The difference between common argumentation and formally correct argumentation is that in formally correct argumentation we use signs, which are supposed to be entirely unambiguous, e.g., empirical evidence obtained through empirical research, statistical evidence based on the processing of actual data, methodological research carried out or by confirming and referring to applicable general laws and theoretical findings (Kahneman's System 2), while common argumentation occurs in the natural language, where ambiguity is not excluded a priori (Kahneman's System 1).

SYSTEM 1 vs SYSTEM 2

In his work, Kahneman (2011) presents his current understanding of judgment and decision making, which has been shaped by psychological discoveries of recent decades. Our main aim here is to present a view of how the mind works that draws on recent developments in cognitive and social psychology. One of the more important developments is that we now understand the marvels as well as the flaws of intuitive thought. Kahneman did not address accurate intuitions beyond the casual statement that judgment heuristics ‘are quite useful, but sometimes lead to severe and systematic errors. He focused on biases, both because he found them interesting per se, and because they provided evidence for the heuristics of judgment. He did not ask himself whether all intuitive judgments under uncertainty are produced by the heuristics we studied; it is now clear that they are not. In particular, the accurate intuitions of experts are better explained by the effects of prolonged practice than by heuristics. We can now draw a richer and more balanced picture, in which skill and heuristics are alternative sources of intuitive judgments and choices.

When confronted with a problem – choosing a chess move or deciding whether to invest in a stock – the machinery of intuitive thought does the best it can. If the individual has relevant expertise, they will recognize the situation, and the intuitive solution that comes to their mind is likely to be correct. This is what happens when a chess master looks at a complex position: the few moves that immediately occur to him are all strong. When the question is difficult and a skilled solution is not available, intuition still has a shot: an answer may come to mind quickly – but it is not an answer to the original question. The question that the executive faced (should I invest in Ford stock?) was difficult, but the answer to an easier and related question (do I like Ford cars?) came readily to his mind and determined his choice. This is the essence of intuitive heuristics: when faced with a difficult question, we often answer an easier one instead, usually without noticing the substitution. The spontaneous search for an intuitive solution sometimes

fails – neither an expert solution nor a heuristic answer comes to mind. In such cases we often find ourselves switching to a slower, more deliberate and effortful form of thinking. This is the slow thinking of the title. Fast thinking includes both variants of intuitive thought – the expert and the heuristic – as well as the entirely automatic mental activities of perception and memory, the operations that enable you to know there is a lamp on your desk or retrieve the name of the capital of the UK.

The distinction between fast and slow thinking has been explored by many psychologists over the last twenty-five years. Kahneman (2011) described mental life using a metaphor of two agents, called System 1 and System 2, which respectively produce fast and slow thinking. He speaks of the features of intuitive and deliberate thought as if they were traits and dispositions of two characters in human mind. In the picture that emerges from recent research, the intuitive System 1 is more influential than your experience tells you, and it is the secret author of many of the choices and judgments you make. The basic elements of a two-systems approach show how associative memory, the core of System 1, continually constructs a coherent interpretation of what is going on in our world at any instant. We attempt to give a sense of the complexity and richness of the automatic and often unconscious processes that underlie intuitive thinking. The goal is to introduce a language for human thinking and talking about the human mind. If we talk about artificial intelligence, we must be aware of the difference between humans and AI. Artificial intelligence works only based on optimization algorithms, like human system 2, which is strictly mathematical, without intuition, and system 1.

For the act (speech, writing, persuasion) to be truly effective, three factors need to be considered, which Aristotle describes succinctly using three terms:

> ETHOS (personality, charisma, reputation). Appeal to the audience through affection.
>
> PATHOS (passion, emotions). Each word, not heard by the audience, is lost.
>
> LOGOS (logic, language, the mind). Common-sense reasoning.

Three kinds of arguments are known in this respect:

- Arguments of the type ethos (these are ‘arguments of power’). For example: “I am your professor, I know best…”

- Arguments of the type pathos (playing on emotions).
- Arguments of the type logos. These are logical arguments based mainly on the above described (logical) ways of scientific thought.

In most cases, scientific thinking and argumentation are based on common sense. Hence, let us focus only on the logos, or logical argumentation/reasoning. According to Aristotle, this means persuasion supported by reason, facts, knowledge. Aristotle described 19 ways, syllogisms, from which we arrive to valid conclusions based on premises.

EXAMPLE:

- All X's are Y's. S is an X. Therefore, S is a Y.
- All men are mortal. Socrates is a man. Therefore, Socrates is mortal.

The word *logic (logical)* is used in different ways, for example, also as a synonym for acting rationally. In this case, logic is one of the factors of acting rationally.

EXAMPLE:

Someone is hungry and eats a piece of cheese.

The logical way of argumentation is as follows:

1. *Knowing one's intention:* to satisfy hunger.
2. *Including one's premises, knowledge about the world:*
   - Hunger is satisfied by eating food,
   - cheese is food,
   - there is a piece of cheese in front of me,
   - I can eat this piece of cheese.
3. *Calculating***:**
   - If hunger is satisfied by eating food, and if cheese is food, then hunger is satisfied by eating cheese;
   - If hunger is satisfied by eating cheese, then I can satisfy my hunger by eating this piece of cheese;
   - my goal is to satisfy my hunger, therefore, I will eat this piece of cheese.
4. *What is reasonable (logical) behavior, if you are hungry and you have a piece of cheese? TO EAT IT!*

Other models, created on the basis of syllogisms (Toulmin; Perelman)

Toulmin (2003) developed his own model of argumentation, which is based more on 20th century epistemology than on informal logic of the Aristotelian type. The model represents a kind of criticism of the assumption of many Anglo-American philosophers that any important argument can be expressed in a formal form: not only as a syllogism (since Aristotle, any inference could be called a syllogism or "connection with a statement"), but as a rigid demonstrative deduction, something that can already be found in Euclid's geometry. This Platonist tradition was highlighted some 2000 years later by Rene Descartes. Let us look at some examples of such argumentation (Aberšek, Kordigel Aberšek, 2019):

MODUS PONENS

Its structure is as follows:

Premise 1: If P, then Q.

Premise 2: P.

*Conclusion: Therefore, Q***.**

EXAMPLE:

If it rains, then there are puddles.

It is raining.

Therefore, there are puddles.

MODUS TOLLENS

Its structure is as follows:

Premise 1: If P, then Q.

Premise 2: Not Q.

Conclusion: Therefore, not P.

EXAMPLE:

If a stranger enters the house, the dog barks.

The dog is not barking. Therefore, whoever is entering, is not a stranger.

HYPOTHETICAL SYLLOGISM

- If P, then Q. And if Q, then R.
- Therefore, if P, then R.

EXAMPLE:

- If you eat sweets, you will get fat.
- If you are fat, it's a threat to your health.
- If you eat sweets, it's a threat to your health.

LOGICAL OR DISJUNCTIVE SYLLOGISM

- P or Q.
- Not P, therefore Q.

EXAMPLE:

- Drink some milk or have some bread.
- I will not have any milk.
- Then have some bread.

DILEMMA

- P or Q.
- If P, then R.
- If Q, then S.
- Therefore: R or S.

EXAMPLE:

- The new machine will function well, or it will be useless.
- If it functions well, it will create a profit.
- If it fails to function, it will create a loss.
- Therefore: it will be either profit or loss.

EXPLANATION IN SCIENCE

What exactly does it mean to say that a certain phenomenon can be "explained" using science?

Carl Hempel (1965): Covering-Law Explanation Model

Scientific explanations are usually offered as satisfactory answers to what Hempel called "explanation-seeking why-questions" (Hempel, 1965). If we could determine the essential characteristics, which such an answer must contain, we would be able to understand what a scientific explanation is.

Hempel suggests that scientific explanations typically have the logical structure of an argument; a *set of premises* followed by a *conclusion*. The conclusion states that the phenomenon that needs explaining (in our case, climate change, global warming, or environmental footprint) occurs, and the premises tell us why the conclusion is true.

Hempel's covering-law model addresses an explanation as a deduction from laws in conjunction with views on preconditions. Hempel defines this as follows:

> "[The covering-law] explanation answers the question: *Why* do explanatory phenomena occur at all? By showing that the phenomena arise from certain particular circumstances C1, C2, … Ck, depending on certain laws L1, L2, …Lr. By exposing this, the argument shows that, given the particular circumstances and the laws in question, the occurrence of the phenomenon could be *expected;* and it is in this sense that the explanation enables us *to understand why* the phenomenon occurred." (Hempel, 1965: 337).

Based on the well-known position expressed by Hempel and Oppenheim (Hempel and Oppenheim, 1948), explanation has the structure of valid deductive arguments, in which the explanation is a connection of *two premises – a statement of initial conditions and a statement of general laws* – and the explanation is a conclusion describing the empirical phenomenon, which we wanted to explain, which is shown in Figure 1_4.

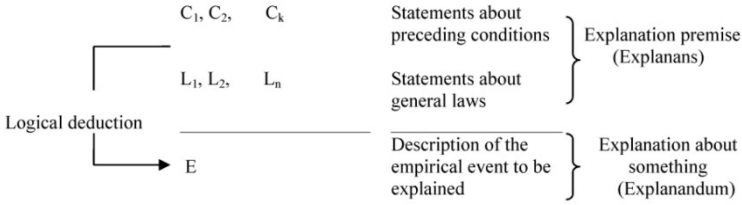

Figure 1_4: The form of Hempel's and Oppenheim's explanation of the covering law.

Example (Hempel, 1965):

A mercury thermometer is used to measure the temperature of hot bodies, especially liquids. If the thermometer is rapidly immersed in hot water, there occurs a temporary drop in the mercury column, which is then followed by a swift rise. How is this phenomenon explained?

The increase in temperature affects as first only the glass tube of the thermometer; it expands and thus provides a larger space for the mercury inside, whose surface therefore drops. As soon as the by heat conduction the rise of the temperature reaches the mercury, however, latter expands, and as its coefficient of expansion is considerably larger than that of the glass, a rise of the mercury level results. This account consists in statements of two kinds. Those of the first kind indicate certain conditions which are realized prior to, or at the same time as, the phenomenon to be explained; we shall refer to them briefly as antecedent conditions. In our case, antecedent conditions include, among others, the fact that the thermometer consists of a glass tube which is partly filled with mercury and that it is immersed in hot water.

The statements of the second kind express certain general laws; in our case, these laws include the laws of thermic expansion of mercury and glass, and a statement about the small thermic conductivity of glass. The two sets of statements, if adequately and completely formulated, explain the phenomenon under consideration; they entail the consequences that the mercury will first drop, then rise.

Thus, the event under discussion is explained by subsuming it under general laws, i.e. by showing that it occurred in accordance with those laws, by virtue of the realization of certain specified antecedent conditions.

Covering Law and Reduction

The covering law explanation model was closely related to the reduction model, developed by Nagel (1961). In both models, the deductive relation is essential. According to the Nagelian model of reduction, if we can conclude that a law of theory M can be derived from a law of theory K, then we can say that we can reduce M to K – the reduction is feasible. We could even say that examples of Nagel's reduction are examples where the reduced theory is explained by the reduction theory itself. Thus, Silberstein wrote that the Nagelian model of reduction

> "/…/ treats intertheoretical reduction as deductive, and as a special case of [covering law] explanation." (Silberstein, 2002: 85).

A historical understanding of how science works

Understanding the process of science can protect people against misinformation. One of the most intriguing stages in the process of science is noticing when something is "weird". The year 2020 was a historic year, unfortunately, for the most part, not in a good way. There was a historic level of disregard of scientific advice with respect to the newest example of the Covid-19 virus. But while the events of 2020 may feel unprecedented, the social pattern of rejecting scientific evidence did not suddenly appear in that year. There was never any good scientific reason for rejecting the expert advice on Covid, just as there has never been any good scientific reason for doubting that humans evolved, that vaccines save lives, or that AI after 2022 and ChatGPT help people and makes their lives better. To understand the social pattern of rejecting scientific findings and expert advice, we need to look beyond science, and to history, which tells us that many of the various forms of the rejection of expert evidence and the promotion of disinformation have roots in the history of the tobacco industry (Oreskes, 2020).

Throughout the first half of the 20th century, most people saw science as something that makes our lives better. Science has deepened our understanding of the natural world, which helped us to cure diseases, light our homes and bring new forms of entertainment into our lives. Research and development really did produce products that measurably improved many lives. But science was also developing the playbook for science denial and disinformation. The chief culprit in this darker story was the tobacco industry. Its disparaged science by promoting the idea that the link between tobacco use and lung cancer and other diseases was uncertain or incomplete and that the attempt to regulate it was a threat to humans' freedom. The industry made products more addictive by increasing their nicotine content while publicly denying that nicotine was addictive. With these tactics, the industry was able to delay effective measures to discourage smoking long after the scientific evidence of its harms was clear. The same arguments were used to delay action on acid rain, the ozone hole and climate change, and in the year 2020 we saw the spurious "freedom" argument being used for example to disparage mask wearing or vaccinating. We also saw the 'tobacco strategy' seeping into social media, which influences public opinion and which many people feel needs to be subject to greater scrutiny. Computer scientists have complained that social media contributes to the

spread of AI denial by permitting false or misleading claims while hobbling responses by mainstream scientists by labeling their posts 'political'. Without a historical perspective, we might interpret this as a novel problem created by a novel technology. Like the tobacco industry, social media and IT companies sold us a toxic product while insisting that it was simply giving consumers what they wanted.

With computer-related anxiety, addiction, dependence, stress, and post-traumatic stress disorder on the rise, a contingent of mental health professionals are developing a new standard of mental healthcare for our technologically changed world. Their profession faces a steep learning curve. There is growing recognition in the field of psychology and cognitive science that people are experiencing distress over technologically changes. That means, presumably, the mental health impacts could worsen into the future. Society will have to adapt to many changes, including how we treat the attendant grief and anxiety of life on a less stable planet. *People are existing and dealing with personal problems in the context of this global crisis now. And the global crisis will impact on the way you deal with personal problems.*

We should probably opt for a bottom-up model to address technological changes, regardless of how illusory it may appear. We need to be aware that the interests of influencers (IT industry) and the interests of the everyman are usually worlds apart. Influential people from IT are aware that they can "buy" their own world, their own (private) school system, their own part of the "paradise", where they will create "ideal conditions" at the expense of others. But the everyman will have to live in the public schools in the (part of the) world that will remain. Our strength, the power of the everyman, is in the masses. But our problem is that we lack the awareness, that we lack faith, that we fail to realize that the only way to achieve change is to join forces and that with this in mind, we must forget all that divides us and instead, to connect regardless of differences between us. We should realize that we are really running out of time, that in the optimistic version we are at a deception point, from which there is no return, through pessimists would say that we have already crossed this point a long time ago. We have entered a period of chaos, a period of possible great change. The only problem with this is that we need to really know what we want and be aware that we do not have much time left to act. With this in mind, we have at least two enemies: