Universal Priority of Final Causes

Scientific Truth, Realism and The Collapse of Western Rationality

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Introduction

This book comes in part from the experience I have had since I graduated and started working on data analysis and machine learning, and also got involved in the trading. The models and abstractions I learned in physics and computer science rarely helped in predicting complex phenomena. More than once, too, I saw scientists claiming to understand and explain arbitrary issues, but the the way they reasoned at the same time did not help in creating working solutions, investing or making decisions based on models, being less effective than the methods of some of better unlearned practitioners. Even imitating these practitioners was sometimes difficult, because it went against scientific intuition.

Later, I saw that this was not just my experience, but part of a larger crisis in academic fields[1]. Psychology, clinical research and several sciences that use statistics are plagued by a replication crisis, where more than half of published experimental results are false. Dietary advice is just turning 180 degrees, after a couple of decades of aggressive campaigning against animal fats. Economics and econometrics are not very effective, and economists with Nobel prizes can be grossly and tragically wrong (see 2008 crisis, LTCM fund collapse). European policymakers, peculiarly oblivious to the vagaries of the weather, have just engineered an energy crisis for themselves, and European technology is becoming increasingly irrelevant compared to the Asians and the US. Physics has not made significant progress for years, so the criterion for determining this progress is due for an update. At the same time Kuhn reigns supreme in the philosophy of sciences, claiming that the progress of physics is a construct of mob psychology, and a rapidly multiplying circle of his acolytes began to see a whole host of other social constructs. At the same time, studies in humanities are being depreciated; they often do not provide professional benefits, and where they are paid, they rarely pay off.

Social construct experts, however, did me a favor by creating cognitive dissonance which I found difficult to ignore. I needed an *good* historian of physics, which turned out to be Pierre Duhem.

[1] I borrowed part of the following enumeration from the essay (Taleb, *The Intellectual yet Idiot*)

Duhem in 1905 observed that mathematical relationships between measured quantities are discovered better and better in physics, regardless of the revision of our knowledge. They are not overturned with physical theory, and all the precious inheritance of an old theory becomes a special case of a new theory. This is the great meaning key of the history of physics, about which I wrote more extensively in "The Order and Contingency"[2], showing the progress of physics from the scholastics, to Newton, Euler, Cauchy, Ampere, Lavoisier and other great men on whose shoulders rests this greatest anomaly in the history of human thought, which has become the object of admiration of all nations.

Above this key of meaning, however, there is something else. A more general algorithm of thinking and a principle that animated the thinking of all these people and applies to physics as well as to other fields: social sciences, complex systems, language, strategy, business and also problems of philosophy. Here is that algorithm: **reasoning is based on the discovery of the ordering of phenomena for the sake of future effects**. Not only its importance is attested to by a great number of scholars up to the end of the 19th century, but it gives us the answer, how to apply the methods of physics and justify its conclusions. It also allows us to answer why medicine or economics are different from physics, why the technical solutions are different from basic research, why the financial model is applied differently from the physical model, why the logical models of language do not match the language itself, and on many other important problems.

The principle above is called the *principle of finality*, and much of European philosophy is founded on it. From the virtue ethics and natural philosophy of the ancients, to the philosophy of St. Thomas Aquinas and finally the doctrines of modern scientists. It is applicable virtually everywhere, as is not simply a heuristic that seems to work, but a fundamental aspect of our world, having change, causality and time. Thus, by this very principle, what is scientific and philosophical is distinguished from what is a myth or poetry. Among the defenders of the philosophy of purpose, one can mention in particular Cauchy, Euler, Ampere and other modern scientists and also many philosophers, of whom I

[2] Zawistowski, *Order and Contingency*

will mention only a few from the 20th century. In particular, I can recommend Cauchy's „Sept lecons de physique generale", the works of Fr. Stanley Jaki, the works of Duhem already quoted abundantly in "The Order and Contingency" and , "The Order of Things" by Fr. Garrigou-Lagrange. Most of them do not refer directly to final causality, but nevertheless write mainly based on it, taking it as a basic tool. The latest book is precisely a philosophical treatise on the principle of finality written in the spirit of scholastic philosophy.

The goals of my work are essentially two: I want to lay out the basic aspects and applications of finality, especially in the context of science and using more modern examples, insofar as every learned person should understand them for their own benefit. And secondly, it is necessary to answer why this philosophy is forgotten or undermined, and at the same time errors so common and proclaimed with such certainty. The reason, in turn, is erroneous philosophy that have proliferated in the West over the past 200-300 years, especially: positivism, irrationalism, psychologism, mechanicism, evolutionism. An encyclopedia almost on this subject has already been written by Fr. Jaki[3] I intend to demonstrate and refute their main errors in a simpler and clearer way by taking the principle of finality precisely as the main method.

[3]especially the books , "The Relevance of Physics", "Science and Creation", "The Road of Science and Ways to God".

1 Main Theses

1.1 Final Cause as the Foundation of Definition

The definitions of many concepts refer not to the appearance or composition of matter, but to the ordering of phenomena with respect future effects, that is to finality. Here are a few examples.

To define what acorns (oak seeds) are, it is not enough to say that they are brown, a few centimeters long, composed of cellulose and proteins. More importantly, when we stick acorns in fertile soil, with access to water, they will germinate and grow into a plant that can become a large tree.

The eye, according to the dictionary definition, is for seeing, and this is the only definition that is consistent with the actual use of the word. The eyes of different species, including insects, have very different appearances and structures, and recently also may contain bionic elements, such as lenses implanted in patients with cataracts, or various experimental projects of an artificial eye. The elements are different in the organs of different organisms, but they are finely tuned within each individual system. The fine-tuning is precisely such that the lens, pupil, retina, and photosensitive cells work together to create and record an image.

So to tell whether a system is an eye or not, you have to tell whether the entire system is capable of seeing or not.

Similarly, for example, we recognize an airplane. Metal objects rarely fly, being heavier than air. However, if something has wings, a propeller, and an engine, it can take off without breaking the laws of physics. So when we see these elements put together to produce lift and thrust (to move the vehicle forward), we say "airplane." The shapes can be very different: one fuselage, or two. High-wing, low-wing, flying wing, duck-delta, cylinder (Coleopter), or pancake (Vought V-173).

When I write this book, the letters I see on the screen are arranged in a certain way, because they are supposed to express a certain thought. The laws of physics that make the computer work do not explain their arrangement, because that would explain the letters arranged completely randomly just as well. The data carrier is not as important as the content, the order. Or when I have two editions of "With Fire and Sword" in front of me, one from the 21st century and the other from the 19th, they differ in page numbering, modernized language, and other things. Both editions, however, convey the content according to the author's intention: hence we say that it is the same book.

1.2 Significant Knowledge about the World Allows us to Anticipate the Future.

We get to know the world through our senses, but not only through our senses. Our minds process not only sensory impressions, but also a certain interpretation. A visual impression includes a certain ordering: for example, when I see certain shapes and a line in the sky, I state "an airplane is flying", and when I see a silver crescent, I think "the moon".

However, neither the use of these concepts nor their construction is merely an effect of one image in our eyes. The world is changeable and time flows in it. What we saw yesterday is different than what we see today. A more relevant knowledge than sensory impression itself is the ability to predict aspects of reality. We know that the moon this morning is the same as the one seen in the evening a week ago, even though it has a different shape and a different azimuth and elevation, and the sky is a different color. We know the rules according to which these things change and we can anticipate future effects. This is precisely the finality, the order of causes for the future effect.

Example 1.1 *In ancient times, Venus was considered to be two separate stars, one of which was seen in the evening and the other in the morning. The planet Venus is invisible at night, being closer to the Sun than the Earth: This gives rise to the apparent absurdity: that "the morning star is the evening star" is some logical sense is the same as "Venus is Venus" because Venus is both the morning and evening star.*

But this absurdity is apparent and created artificially. This is precisely one of the absurdities to which non-teleological (ignoring final causes) theories of language lead, because definitions are often given by final causes. Only by knowing the orbit of Venus and being able to predict future observations of the planet can I say that they correspond to both the morning and evening star; and the meaning *of the word Venus must implicitly refer to such a model.*

1.3 The Fundamental Role of Final Causes in Science

Euler, Newton, and other scientists pointed out that final causes occupy an important place in physics. Euler [4] introduced the variational principle, which is the foundation of most physical theories to this day.

It claims that for every phenomenon there is some sum or integral of physical quantities that takes on a maximum or minimum. So, for example, light travels along such a path that the time of flight is minimal; a chain hangs so that its center of mass is as low as possible. Free motion in the General Theory of Relativity is characterized by the fastest flow of local time, so time for satellites in orbit flows faster than on Earth. This is what Euler calls "reasoning from final causes," because phenomena are globally ordered with respect to a total quantity.

Similarly, many other physical reasonings are based on the discovery of the global ordering of causes with respect to some anticipated effect. Let's consider an example.

Example 1.2 *The cause of the Challenger space shuttle disaster is said to be that rubber seals in the booster assembly became brittle and inflexible in the cold, allowing hot gases to escape. That is, the seals failed, preventing the future effect of maintaining an engine gas-tight during the flight. But a leaking seal is not the direct cause of the disaster. At most, it is the cause of hot gas leaks, which does not necessarily have to cause a disaster. In the SR-71 reconnaissance aircraft, leaks were a predictable effect, because the deliberately leaking system sealed only at the right speed, when the heated components expanded.*

In the Challenger disaster, a gas leak from the booster burned through a strut connecting the booster to the fuel tank, which led to the entire vehicle falling apart, due to the enormous stresses created by air resistance and the lander crashing into the ground. If the failure had occurred at a much higher altitude, there might not have been a disaster. 100 kilometers above the ground there is

[4] Zawistowski, *Order and Contingency*, p. 92

almost no air resistance: the set would not fall apart and the lander could accelerate to escape velocity, safely reaching Earth orbit.

Reasoning about the cause of the disaster does not concern direct causes as they are recognizable by the senses. I am talking about causes such as: a footballer kicks the ball and the ball flies into the goal; the braking wheels of a train cause sparks; when a bell is hit, it rings. In philosophy, such a cause is called an "efficient" cause. Such causes rarely give full account of the phenomena: metals spark when scratched —but why does steel spark, while bronze does not? Or why does tungsten-alloy steel spark red? Or why does one pipe produce higher-pitched sound than another when we blow into it? The answer requires laws of nature concerning, for example, the oxidation reactions, or the mechanics of waves in continuous media and theoretical interpretation based on them. Such interpretation is an abstract and symbolic image of the system in the mind. This representation is meant to model precisely the aspect of the system that enables us to predict the phenomena of interest. For example:

Example 1.3 *The Earth is not truly a point, nor is it a rigid sphere (because it is uneven and flattened at the poles). But for the purposes of celestial mechanics, it is often assumed to be so, as this allows sufficiently accurate predictions of planetary movements.*

We will use "theoretical interpretation" interchangeably with the term "model."

1.4 Questions of "Why did something specific occur, and not something else?"

An important question in science is often "Why did this happen in this specific way, and not differently?" The answer is generally reasoning based on a final cause, rather than an efficient cause.

For instance: if a patient is pale and feeling weak, this can be linked, for example, to a deficiency of hemoglobin. However, to explain why a healthy person might have such a deficiency, one has to point to another cause, such as insufficient iron intake or anemia. Similarly, the aurora borealis arises as a result of charged particles colliding with the atmosphere, but this does not answer why the aurora is seen in rare circumstances in Poland, such as during strong solar storms.

In science, therefore, a cause is something that acts for a *specific* effect. Charged particles are the cause of auroras in general, but to explain why an aurora appears specifically in Poland at certain times, we point to periods of exceptionally high solar activity (and to whole mechanism of charged particles being deflected in magnetic field and ionizing the atmosphere). Following principle thus holds[5]:

> Every agent acts towards a particular, specific effect.

If an agent did not aim at a specific effect, then all effects would be the same for it, and thus it could not act, writes St. Thomas. It would then be impossible to recognize it through experience if it were not tied to specific effects. One might say: a proton and an antiproton aim at a specific effect by being attracted to each other (ibid., p. 164). The contemporary scientific description of physical phenomena still adheres to this principle. Scientific investigation begins with the question: why does a given phenomenon behave in this way and not in another?

For instance, to the question of why planets move in ellipses, one might provide Descartes' answer: because they are carried by great vortices, or the modern answer: because mass curves spacetime. Neither of these answers addresses the most significant part: why do planets move in ellipses and not, for example, in circles, spirals, or in another way? The answer to this question is provided by the universal mathematical law of gravitation, along boundary conditions, the dynamic parameters of bodies in the Solar System.

Similarly, questions are also posed in other sciences. The phenomenon of heredity was known since ancient times, but Fr. G. Mendel, in the 19th century, provided a model while studying the crossbreeding of plants, answering why heredity works in one way rather than another. Some traits are inherited with a probability of 75% if only one parent possesses them—others only with 25%. If we additionally know the traits of earlier generations, we can infer

[5]Fr. Reginald Garrigou-Lagrange, *The Order of Things: The Realism of the Principle of Finality* p. 164

that heredity is controlled by pairs of genes, that each offspring randomly receives one gene from each parent, and that some genes activate only when two identical genes form a pair.

Until the mid-19th century, it was believed that microbes arise spontaneously from inanimate matter. Progress, however, required precisely considering what would change if this theory were not true. Pasteur and other scientists conducted a series of experiments —for instance, if we boil a broth and cut off its access to air, no bacterial growth will occur in it. Therefore, bacteria do not arise spontaneously; their spores are carried in the air.

1.5 Probability and Models.

To find real final causes in the phenomena requires an experimental criterion of justification. One is the requirement of accurate predictions of new phenomena, used in physics and related sciences.

In other sciences, accurate predictions are rarely possible, so the justification of a model relies on less accurate predictions, based on the analysis of probabilities. There are various approaches to the subject of probabilities, but for our theory, "likelihood" is essential. "Likelihood" is the probability $p(Y|X)$ that some event Y will occur, provided that the model X is true. For example: having a perfectly sorted deck of 52 cards, from which we randomly select a card (this is the model X), the probability of selecting a king (event Y) is $\frac{1}{13}$ (there are 4 kings in the deck). Given a fair, perfectly balanced coin with heads and tails (this is the X model), the probability of a head (this is the Y event) is 50

By the way, a "fair, perfectly balanced coin" is not a sensory impression, but a model, a subjective interpretation of reality. We know whether such a model is accurate based on a set of observations and experiments (e.g. whether the center of mass of the coin is in the middle of the cylinder's axis, whether the coin's rim is not filed down on one side, whether the coin and the table are magnetized, etc.). The results of subsequent experiments are also important evidence; if the model assigns a high probability to the observed results, it is effective. If it assigns a very low probability to them, it means that it is disproved.

In physics and beyond, a good model is generally one that is confirmed by many independent and accurate predictions that always work. In physics, Newton's mechanics accurately describe celestial mechanics, the tides of the seas, and the dynamics of objects in our everyday experience. In language modeling, we hear about probabilistic large language models (LLMs) trained on vast datasets from the internet, which are capable of answering various complex questions, thanks to a mathematical, approximate representation of the training set. An improvement over these are multimodal models, which, when trained also on images or sounds, can answer questions based on audio and visual data as well. A multimodal model can be better than a text-based one: by hearing my voice, it might understand, for example, a sarcastic tone or other aspects of intonation that are inaccessible to a textual model. With the availability of a photo of a bird in the park, the model might identify it better than just based on a voice description. **The more relevant data we include, the better the model becomes.**

The above observation already challenges the view, held among others by positivists, that there exists a "principle of induction," according to which, by observing the occurrence of a given cause and effect many times, we can determine that it always happens this way, or that it happens with a certain probability. Such a prediction is, in fact, an arbitrary assumption of a simple model, which will rarely be accurate. Useful models predict many different events simultaneously, not just one. Often, a series of similar occurrences is not continued in the future. A chicken, fed daily by its farmer, cannot expect that things will always remain the same[6]. Often, the model must be complex to represent true relationships in the dataset adequately, as is the case with LLMs[7]; a model that is too simple will not be even marginally effective. Similarly, there exists a class of physical theories that describe an unchanging order among measured quantities, which turn out to work, and this state of affairs does not arise out of any necessity (this is, in part, the "contingency" in the title of my book "Order and Contingency").

In other fields of science, we often deal with a different kind of order, such as one resulting from the spontaneous organization of rational participants, as is the case in economics or natural lan-

[6]This example was devised by Bertrand Russell, without, however, drawing conclusions we present here.

[7]For example, language models must be sufficiently large to learn more advanced abilities (Wei et al., *Emergent Abilities of Large Language Models*)

guage (as will be discussed later), hence requiring a different research strategy and different classes of models.

1.6 Purposeful Causes, Business, and Startups.

Purposefulness is an effective tool for reasoning about businesses and products, as a good product is defined not so much by the raw materials and means used but by the problem it solves and the situation it is suited to. I first encountered this theory through Ryan Singer of Basecamp[8].

Both Snickers and Milky Way are chocolate bars with caramel cream (with Snickers also including peanuts). But, thinking about them from the perspective of demand, as Singer points out, we see that people buy them for different reasons, in different situations. As products with specific marketing campaigns and distribution chains, they are optimized for precisely these situations. Snickers, having a higher fat content from the peanuts, can replace a small meal and is advertised precisely as such. "You're not you when you're hungry, grab a Snickers." You can thus buy it at a kiosk along with a newspaper, and people eat it on the go, quickly, in the morning when they skipped breakfast and want something that will give them quick energy. Snickers may be a chocolate bar from the supply perspective, but from the demand side, it competes with bananas, apples, cola, or a roll.

Milky Way is fundamentally different: though the difference in filling is small compared to Snickers, it translates into a significant product difference. People eat Milky Way in the evening, at home, slowly, because they want a treat that provides them some pleasure. Thus, the bar is marketed to emphasize the feeling of bliss and similar traits. It is also slightly smaller than Snickers, weighing 21.5 grams. A Milky Way today likely costs between 1.75 PLN and 3 PLN, translating to a price per kilogram of 80 to 130 PLN (while chocolate candies cost around 30-40 PLN per kilogram). This clever approach allows the American company to earn much, much more, while the customer could save significantly if they bought a handful of local candies instead.

Ryan Singer himself was at the time the strategic director of

[8] A presentation titled "Position, position, position"

the Basecamp platform. At first glance, this platform seems like a similar solution to Jira, Confluence, Asana, Slack, Lark, Trello, Monday, Google Docs, and at least 10 other such platforms designed to organize various types of creative or intellectual work. This raises the question: why would anyone prefer one such platform over another, and particularly why would they pay for one that has only recently appeared and has fewer functionalities? Such a platform, however, Singer argues, must solve a specific situation by targeting a particular customer segment: people satisfied with Basecamp will not be satisfied with Jira and vice versa.

Basecamp is primarily intended for small creative agencies (graphic designers, etc.). In this case, there is no need for many functionalities (complex team management panels, multiple levels of permissions). In fact, these features can even be harmful when the adoption of the tool relies on bottom-up engagement by employees themselves. In such cases, it is better for the tool not to be overly complicated.

Some competing tools, like Slack or Lark, facilitate constant communication, but Basecamp is more of a tool for limited, structured communication, where, for example, the project specification is entered, and afterward, the completed project is sent for approval by the client. In this regard, Basecamp differs from Google Docs or Confluence, which enable collaboration by many people on the same document. However, for the graphic and video segment, such collaboration makes little sense; what is more useful is sending finished assets for approval or review.

In this way, Basecamp can carve out its own piece of the market and also make deliberate decisions about which additional functionalities to build so that both the company and its clients benefit. For instance, it is not worth accepting the addition of too many functionalities, as this would come at the expense of bottom-up adoption of the tool. On the other hand, introducing, for example, automated weekly reminders makes sense, as it aligns with how clients use the application.

Another example of this kind of thinking is Steve Jobs, the late director and co-founder of Apple. Let us recall the launch of the first iPhone in 2007. The phone was a huge commercial success—why? The first iPhone was quite expensive and, at first glance, archaic. It lacked 3G connectivity (so the internet was slow), it could not record videos, and it did not support sending multimedia MMS messages. It also did not have an app system like Symbian, Windows Mobile, or ”mid-range” phones with Java ME. The camera had a resolution of 2 MP, and it lacked a flash. The phone lacked many features a user of, for example, the Sony k800i from 2006 might have expected. However, its standout feature was the large screen with a capacitive touchscreen, which could be easily operated with fingers (unlike older resistive screens)—and this was *for a purpose*. What purpose? We can see this in old advertisements.

They showcase a few simple examples of how the phone could be used with a touchscreen: calling, email, internet, GPS navigation, and multimedia. The touchscreen provided ease of use, enabling people who did not want to invest too much time into technology to quickly learn how to use all these features. These were precisely the key reasons to buy the first iPhone. Competing with better hardware components was not necessary; the target audience was not ”gadget enthusiasts” but a large mass of people who so far had been content with a simple phone. Games and apps weren’t needed either, as they were not crucial for these users or their purchasing decision.

Thanks to this approach, Apple was able to earn more and grow by charging a significant premium for a device that was not the best in terms of technology or quality.

1.7 Game Theory and Strategy as a Philosophy of Final Causes

An important[9] example of final causes is game theory, especially when it deals with complex situations involving human interactions, strategy, and politics. Game theory is sometimes explained using simple, abstract examples: the prisoner’s dilemma, tic-tac-toe, and chess, which more often pertain to mathematics and computer science, but from a practical perspective, complex situations are more interesting than such models.

A general confronting his rival must ask himself what the rival is trying to achieve and what means he intends to use. This, in turn,

[9]Parts of this text were previously used in a podcast on YouTube.

leads to the next question: what would the opponent do, knowing that the general is thinking this way, and what would the general do, knowing what the opponent is thinking, and so on. Strategy is largely a nested theory of final causes. The foundation of successful execution of one's own plans is to outsmart the opponent while also not allowing himself to be deceived, combined with controlling one's own forces, logistics, and strategic situation in a way that is predictable enough.

An example of conflict strategy can be seen in the film The Hunt for Red October. While it is fictional, it illustrates certain concepts well, so I will reference it. Soviet Admiral Ramius plans to defect with a Typhoon-class submarine equipped with ballistic missiles to the United States. The Soviets attempt to track down the rogue submarine, and when American diplomats question their fleet movements, the Soviets lie, claiming that Ramius intends to launch the missiles. The Americans, of course, suspect deception—but it is a clever move: the Soviets know that there is a risk involved, which the Americans may not be willing to take. Even a small chance that Ramius is genuinely insane and intends to launch the missiles is multiplied by the massive potential devastation if the Soviet version were true.

One American agent, however, hypothesizes that the Soviets are lying and that Ramius intends to defect to the United States. But how can this hypothesis be safely confirmed? Once again, through final causes: if Ramius truly wants to defect to the United States, then he has already prepared a plan for doing so without exposing his new partners to excessive risk; the Americans simply need to synchronize with him. Ramius meets with the Americans and he sails to an abyssal, where he can fake the destruction of the submarine without allowing for a possible search of the seabed. He triggers a radiation alarm, causing the crew to abandon the submarine, while he submerges with only a handful of officers participating in the defection.

However, there are two issues: first, the Soviet intelligence, having anticipated such a or similar trick, has planted an undercover agent on the submarine who knows full well that Ramius is not following orders. This agent sabotages the submarine and remains on board after the radiation alarm. Second, a former student and acquaintance of Ramius, a Soviet captain commanding an Alfa-class submarine, is able to deduce Ramius's plan, likely reproducing as Ramius' reasoning: where he would go and what trick he would use to implement the plan. This allows him to find Ramius exactly where Ramius intends to execute his deception. Thus, the story revolves primarily around reasoning about how this or that opponent seeks to outwit and gain the upper hand, or how this or that ally is expected to cooperate. This is an example of game theory in action.

Real examples are provided in The Strategy of Conflict by Thomas Schelling[10], a Nobel Memorial Prize laureate. Negotiations, for instance, rely on similar reasoning. When dividing a mutual reward between two parties, it is often split equally, as neither party would agree to take less (or more, out of courtesy). The symmetry of the issue sometimes establishes such a boundary.

The same applies in war, where most conflicts have aspects not only of competitive but also cooperative games. For example, during the Second World War, chemical weapons were not used[11], largely due to an unspoken agreement. Why? Schelling argues that there was no other obvious boundary than the "prohibition of gas," and thus, it was not in anyone's interest to break this agreement without knowing the outcome—how far the adversary would retaliate and what they would agree to (e.g., would they only target military objectives, or include civilians, perform a few attacks, or conduct many, etc.).

Similarly[12], the boundary lies in the prohibition of nuclear weapons. It follows that the willingness of the United States to retaliate with nuclear weapons in response to a Soviet attack (during the Cold War) would, in practice, depend on expectations of how limited such retaliation would remain and whether it would escalate into an unlimited war. American support for the French in Indochina[13] was limited to supplying resources, and, according to Schelling, it was assumed that engagement in airstrikes would be restricted to such airstrikes and not extend to sending some number of ground and air forces (as there is no clear boundary to define such a number). Similarly, the boundary between two op-

[10] Schelling, *The Strategy of Conflict*
[11] ibid., p. 75
[12] ibid., p. 78
[13] ibid., p. 76

posing forces is often determined by geographical obstacles, such as the Formoza Strait between Taiwan and the People's Republic of China. This is not only because the strait is harder for the attacker to cross and easier for the defender to defend but also because there is no other reasonable boundary (that would satisfy both sides).

In political negotiations, the anticipated costs of agreement or refusal, as well as what various negotiating parties know about these costs, are crucial. In 2022, Austria refused to send weapons to Ukraine because such an action would have required a constitutional amendment. The constitution itself can serve as an argument in negotiations, as it exerts significant pressure and risk on a politician who takes on the decision to amend it along with the responsibility for the consequences of that decision.

Similarly, an argument might be, "If I do this for you, then others will also want it, and I can't allow that." Alternatively, "If you don't do this for me, others won't trust you." A similar argument was recently put forward by Ukrainian MP David Arakhamia, who negotiated with Russia in Istanbul in 2022. According to Arakhamia, Russia wanted, in exchange for peace, a promise that Ukraine would not join NATO, among other demands which Arakhamia dismissed as irrelevant. When asked why they did not accept the terms, Arakhamia responded, among other things, that Ukraine's NATO membership had been stated in the constitution. This, too, is a way of pushing the decision-making preferences toward rejecting Russian demands, as removing this constitutional clause at Russia's request could be seen poorly, either as collaboration or as an affront.

On Russia's side, the high-profile case of Yevgeny Prigozhin, an oligarch and owner of the private military company Wagner, is worth mentioning. In the spring of 2023, a conflict erupted between Wagner's leadership and Defense Minister Sergei Shoigu, allegedly because the latter stopped supplying Wagner with sufficient amounts of ammunition. Wagner had previously operated in Africa and the Middle East. In 2022, due to shortages in the Russian army, the company moved to the Ukrainian front and was also granted permission to recruit volunteers from prisons. Through this, Prigozhin, taking advantage of the conundrum in which the Russian Ministry of Defense found itself, accumulated significant power, leading approximately 50,000 men outside Russian army's structures, and stationed right next to Russia's borders. The Ministry of Defense took considerable risks in allowing that, and similarly it had no business in a private army beyond its control receiving ammunition. This risk ultimately materialized when Wagner staged its march toward Moscow in June.

Other noteworthy sources on this topic include Viktor Suvorov's "Icebreaker" tetralogy, which deals with Stalin's plans for World War II, and the ancient Chinese manuals "The Art of War" by Sun Tzu and "36 Stratagems" along with their commentaries. We will discuss some of that later in this chapter.

1.8 Ethics, Religion and Anthropology

Aristotle, Socrates, and other ancient philosophers developed virtue ethics, which was later adopted by Christianity. The Catholic Church to this day continues to teach about virtues (even in children's books). This theory is a final cause theory and it is very important for my considerations. In out times liberal Western intellectuals openly question final causes and consider them nonsense, despite their role in science and reasoning in general. Attacks on religion, morality, and free will are particularly puzzling, as they often constitute the main occupation of supposed experts in natural sciences. Moreover, their main argument, repeated since the 18th century, presents humans as de facto automata, controlled (by forces of mechanics or electricity depending on current fashion); without any reference to the crucial qualitative difference between a human and a refrigerator or sewing machine.

I will briefly summarize the ethical doctrine of the philosophers. Humans, they taught, have theoretical reason, conscience (moral reason), and free will; and these faculties distinguish them from animals. Their reality is justified by the fact that they describe a specific ordering of the world with respect to effects (like any other judgment about the world). It is impossible, for example, to speak of guilt, as courts usually do, without the concept of sanity and voluntariness, which are some of abilities related to free will.

Reasoning from final cause is then applied to humans, who, along with their environment, are part of some order for sake of future effects (it's not necessary to consider here where this order came from). This order is similar to that found in trees or cows. For example: an apple seed falls into the soil and germinates. It sends out roots (absorbing water and mineral components) stem, and leaves. Then, through photosynthesis processes and using sunlight and chemical components absorbed from the environment, the small tree can nourish itself and grow larger, also producing new fruits and seeds. In this way, a certain algorithm, encoded from the beginning in the seed, is realized. This tree algorithm is an ordering for sake of effect, and by this ordering we define what a tree, seed, fruit, and leaf are.

The "flourishing" of humans can also be examined per analogy (hence probably the Greek word eudaimonia of Aristotle, meaning "happiness" or "flourishing"). Materialists also adopt a similar analogy (more on this later), but reject will and reason as being significant in any way and equate humans with animals. For philosophers, will and reason are very important; this is unavoidable when senses and instincts reveal little more about humans than about animals. Senses are useful for obtaining food or avoiding dangers; but giving too much heed to their urges leads to degeneration and vices. What, however, is the purpose of reason and will? Andre Ampere stated as follows[14][15]:

> Why can man mentally embrace all the centuries if he was limited to an existence of a few years? Why, if he was born for the highest destinies, do his penchants bend him, almost everywhere and at all epochs, under the shameful yolk of the most vile passions?

This was actually his argument for Christianity, but it is, in its essence, teleological argument. We have intellectual capabilities allowing us to grasp much more than the physical world and our daily existence within it. We have the freedom to choose what proves to be noble (forcing ourselves to deny our instincts and senses), or the opposite. Philosophers therefore saw the ultimate goal or "flourishing" of humans and happiness in high and noble things. Such as: truth, beauty, various aspects of moral perfection, and

[14] Hoffman, *André-Marie Ampère: Enlightenment and Electrodynamics*

[15] Wilde, "André Marie Ampère: A Fascinating Genius and Devout Christian"

habits of good conduct and avoiding evil, called virtues. It should be emphasized that most crucial thing about virtue is not usefulness for society (because, for example, there is less theft), or useful for another person (e.g., a poor person to whom someone gives a coat). This is also important, but the greatest benefit, they said, is achieved by the one who practices virtue, attaining happiness and peace, as well as a happy death and some (only vaguely known) afterlife (of which Socrates, for example, taught about[16].

Ancient philosophy thus concentrated on ascetic practice and moral life, which was served by philosophical schools. Theoretical studies developed within the framework of life practice, as the love of truth belongs to virtues. Christianity easily adopted this philosophy as a rational framework for its own religion, while simultaneously priding itself on evidence that it allows one to effectively achieve what philosophers could only attain to a moderate degree.

Here are some fragments from St. Justin's "First Apology" written around 155 AD. St. Justin became a Christian after having much earlier experience with schools of philosophers and managed to find many significant connections. Pagan idols, he claims, are demons, which is not just the opinion of Christians, but also of Socrates (par. 5):

> ...yielding to unreasoning passion, and to the instigation of evil demons, you punish us without consideration or judgment... And when Socrates endeavoured, by true reason and examination, to bring these things to light, and deliver men from the demons, then the demons themselves, by means of men who rejoiced in iniquity, compassed his death, as an atheist and a profane person, on the charge that he was introducing new divinities; and in our case they display a similar activity. For not only among the Greeks did reason (Logos) prevail to condemn these things through Socrates, but also among the Barbarians were they condemned by Reason (or the Word, the Logos) Himself, who took shape, and became man, and was called Jesus Christ;

God in Christian understanding is closely connected with virtue ethics, as He created the natural order (par. 6).

[16] Cicero, *Tusculan Disputations*, par. XXX

> And we confess that we are atheists, so far as gods of this sort are concerned, but not with respect to the most true God, the Father of righteousness and temperance and the other virtues, who is free from all impurity.

Christian religion, he says, allows to reach moral excellency easily (par. 15):

> And many, both men and women, who have been Christ's disciples from childhood, remain pure at the age of sixty or seventy years; and I boast that I could produce such from every race of men. For what shall I say, too, of the countless multitude of those who have reformed intemperate habits, and learned these things?

According to the author, pagan philosophers before Christ and other noble people can also count on eternal life, as they lived according to the Logos, in accordance with reason and conscience (par. 46):

> We have been taught that Christ is the first-born of God, and we have declared above that He is the Word of whom every race of men were partakers; and those who lived reasonably are Christians, even though they have been thought atheists; as, among the Greeks, Socrates and Heraclitus, and men like them... So that even they who lived before Christ, and lived without reason, were wicked and hostile to Christ, and slew those who lived reasonably

If humans have reason and free will, then they have also moral obligation, even if they know no God and religion (par. 28).

> In the beginning He made the human race with the power of thought and of choosing the truth and doing right, so that all men are without excuse before God; for they have been born rational and contemplative. And if any one disbelieves that God cares for these things, he will thereby either insinuate that God does not exist, or he will assert that though He exists He

> delights in vice, or exists like a stone, and that neither virtue nor vice are anything, but only in the opinion of men these things are reckoned good or evil. And this is the greatest profanity and wickedness.

The philosophy of final causes is thus closely linked to religion; by examining the rational nature of man, it derives moral principles similar to Christian ones (for example, condemning licentiousness, as agreed by Socrates, Aristotle, or Cicero) and recommends the practice of virtues and asceticism so that will and reason may gain the power to control lower desires. Catholicism easily adapted such philosophy as its own algorithm of thought, presenting itself as a superior philosophy and also providing a way to achieve the desired flourishing. The doctrines of the philosophers were still very imperfect in relation to the nature of the highest human good: Plato, for example, justified totalitarianism in his work "Republic." Christians, on the other hand, particularly emphasized love of neighbor, the benevolent order of the whole creation, and finally the love of truth. All this has borne great fruits in Western civilization, including in the field of science, which I wrote about last time.[17]

The liberal intelligentsia, however, does not primarily question religion (there are currently various liberal Christian denominations) but rather the philosophical algorithm behind it. They say, for instance, that there is no free will, that it is moral to yield to feelings, or that ethics actually arises from social relations of man, or that it is reduced to the principle of not harming others. This requires questioning the teleological interpretation of man, asking "why" man can comprehend so much with his mind, given that he has only one short life, "why" he is simultaneously drawn to sublime and noble things as well as to base ones; and thus also questioning the philosophy of final causes altogether.

1.9 The Close Connection Between Teleological Ethics and Strategy

"Art of War" and "36 Strategems" reveal to us that Chinese strategic thought is strongly rooted in Confucianism, which serves most

[17] Zawistowski, *Order and Contingency*

of East Asia as an ethical, social, and metaphysical theory. Confucianism, notably, contains an ethical theory similar to the European one, not speaking directly of teleology. It implicitly recognizes that true good is the good of the intellect and conscience, pointing to the need for social harmony and moral behavior in accordance with a person's moral sense. It lists virtues such as righteousness, ritual propriety, magnanimity, etc.

The Confucian state should, above all, cultivate this harmony. It is through this that the emperor had the privilege of power, the Mandate of Heaven. Consequently, the state itself should also be characterized by the best possible harmony. Military actions, such as waging war or punishing the offenders, although necessary for the ruler, are not a cause for praise, as they disturb harmony. Hence the greater role of covert actions in Asia. A properly conducted war should not so much be a clash of two forces as it should be ensured in advance that the enemy's power secretly crumbles, to collapse at the moment of confrontation, falling like a house of cards.

Ethical theory is significant here, allowing us to understand what people want. A true sage, similar to Cicero's opinion, not only possesses reason but also follows it according to virtue. Weaknesses in this regard can turn into a disadvantage. Here is a story from the Spring and Autumn period[18]. The smaller states of Yu and Guo bordered the larger Jin. Prince Xian of Jin wanted to subjugate both, and his general Xun Xi devised a trick to bribe the greedy prince of Yu with gifts, so that he would allow the passage of Jin troops, which could then take Guo by surprise. One of Yu's ministers pointed out that with fall of Guo, Jin could just as easily attack Yu, but he found no favor. Xun Xi thus conquered both Guo and Yu, taking back the offered gifts in the process. Another similar trick from "36 Stratagems" involves offering beautiful women to a competitor. "Help the enemy in his debauchery and indulgence in music to weaken his will. Lavish him with generous gifts of pearls and jade, and beautiful women," advise the "Secret Teachings" of Tai Gong (ibid).

The vice is thus a weakness. At the same time a noble ruler does not necessarily lose anything, being able to rule more easily. The stingy ruler of Qi, Xiong (ibid.), feared that his (otherwise

[18] Verstappen, *The Thirty-Six Strategies*, p. 155

loyal) general Tian Dan would seize the throne for himself. One day, Tian Dan warmed an old man with his cloak as he crossed a cold river and fainted from exhaustion. When Xiong heard about this, he became angry, thinking that Dan was surely plotting to seize power by doing such deeds in public. However, he received advice to turn the situation to his advantage by announcing that Dan was best fulfilling the king's will by feeding the hungry and clothing the needy, praising him for it, and ordering other officers to do the same. In this way, the people attributed Dan's benevolence to the king (at the same time, Xiong had the opportunity to care for the poor).

A righteous and upright leader, such as Saint Louis IX or Stephen Bathory were, must renounce certain things to demonstrate competence and ethical standards, but in return can count on subjects who will serve him out of conviction and duty. A villain on the throne, however, lives as an anecdote of sword of Damocles shows. The tyrant Dionysius, hearing from one of his courtiers, Damocles, that he was the happiest of men, allowed him to occupy his bed and feast for a day, but hung a sword over him on a horsehair, symbolizing the danger lurking from various sides for the ruler. The danger arises from problems with human management. A ruler needs an armed guard who will not betray him, as well as generals and spies who will not turn against him. And those who are wise, good, and noble will not seek favors from a tyrant, knowing that their loyalty must end when he orders them to do something bad, which in turn may bring his wrath upon them. Therefore, the tyrant must appeal to those who do not have such moral scruples. He may claim, like Machiavelli or Stalin, that people are essentially villains and must be controlled using fear, which on one hand may be a projection, and on the other a description of his own surroundings.

Managing such a situation, however, requires skillful management of motivations, generally appealing to drives such as fear, hubris, money, and pleasures, as well as game-theoretical predictability and deceitful scheming: pitting the weaker against the stronger, involving into crimes, and shifting blame.

Stalin, once a bandit and provocateur, devoted much energy to managing the secret services. They posed a deadly threat to him: what is the use of bodyguards to protect from assassins, when the bodyguards themselves can poison or strangle, or a subordinate fearing purges can send an assassin, knowing exactly how to do it.

Stalin ensured that two secret agencies, the NKVD and military intelligence, competed with each other. Not only could neither have a monopoly on their activities, but their leaders were kept busy ensuring that the competition did not become too powerful. This also meant that Stalin's assassin would gain little, as they would have a significant problem taking power. Moreover, Stalin replaced the head of the services every few years, while the previous one was killed. Lavrentiy Beria, the head of the NKVD, lasted longer; one of his strategies was organizing staged assassination attempts on Stalin, from which he would "save" him. Scientists are currently investigating whether Beria poisoned Stalin[19]. Whether he ultimately raised his hand against the red tsar is something we may not find out soon: certainly, however, he had a motive, means, and plenty of time to plan. In 1953, he ruled the USSR for several months before being removed and killed in a plot by Khrushchev and Zhukov.

King Henry VIII of England, after breaking with the Catholic Church, devised a plan to plunder church property and loot various rich sanctuaries[20]—for this, however, he needed suitable executors of this plan. Notably, such an act would have been considered a great villainy just 10 years earlier. The same sanctuaries of St. Augustine of Canterbury and St. Thomas Becket, which 10 generations of English had adorned with treasures, were now to be plundered. In plain terms, the king needed the biggest robbers he could find. But for them to want to work for him, he had to share with them. The commander of the operation, Cromwell, became immensely wealthy, receiving 30 parcels of monastery land and the title of Earl of Essex, along with other offices that made him de facto the second person in the state after Henry himself.

However, the newly minted first minister forgot that he was only needed by the king for plunder, and being a mere brigand, he had no "soft power" in the corridors of power. When Cromwell had served his purpose, he quickly ended up in a dungeon as a "traitor" and was beheaded, despite his servile letters to Henry.

[19] Barth, Brodsky, and Ruzic, "What did Joseph Stalin really die of? A reappraisal of his illness, death, and autopsy findings"

[20] Cobbett, *Historya Reformy Protestanckiej w Angliji i Irlandyji*, 65

Thus, Cromwell learned that the favor of tyrants is fleeting, which is not so much a problem of the tyrants themselves as of his own situation. For if Henry could kill many decent people and even two of his wives, why would he treat the brigand Cromwell any differently?

Moreover, such a life did not bring happiness to Henry himself. After he had his second wife[21] killed for adultery ("sent her to the block, together with a whole posse of her relations, lovers, and cronies."), he "raged and foamed like a wild beast, passed laws most bloody to protect himself against lewdness and infidelity in his future wives, and got, for his pains, the ridicule of the nation and of all Europe..." It is in this way that we see the sword of Damocles is something real. Nevertheless, there have been rulers over whom it never hung.

Let's turn to Poland, which, I believe, urgently needs such a reading of its history. This does not belong in this book, so I will give one non-controversial (ancient) but instructive example. It illustrates what betrayal looks like, which often takes more subtle forms than literal collaboration. Scenarios, for example, such as: find some naive person and keep them convinced that they are brilliant, and that what you want from them is their idea.

We all know Hieronim Radziejowski from "The Deluge," from the minor allusion that John Casimir Vasa banished Radziejowski while having an affair with his wife. Radziejowski fell out with the king, but not over the affair[22]: the marriage with Sluszka was a marriage "of convenience," as Radziejowski hoped for the estates of the wealthy, though debauched widow. When she began to have an affair with the king, initially the vice-chancellor Radziejowski was in favor of it, seeing new opportunities to gain. Unfortunately, he miscalculated: John Casimir planned to annul the marriage, which would deprive him of the estate. Radziejowski revealed the king's affair to the queen, for which the enraged king sentenced him to banishment, using, among other things, the pretext of Radziejowski's feud with the Słuszka family.

Radziejowski went into exile, plotting how to take revenge on John Casimir and turn the situation to his advantage. He had a

[21] ibid., p. 119

[22] Based on the history from "Poczet Zdrajców Polski" by Jacek Komuda

few aces up his sleeve: an excellent knowledge of the intricacies of palace politics in Warsaw, as well as access to a large amount of secret information, for example, about the weak state of the Polish-Lithuanian Commonwealth, torn by wars. In Austria, he tried to recruit an army to capture Kraków, then at the Swedish court, he plotted an anti-Polish alliance. Finally, he devised a plan to replace John Casimir with another king, under whom he himself would rise to honors. Radziejowski found a sympathetic listener in Karl Gustav. However, things did not go according to his plan: Karl Gustav may have listened to Radziejowski's plans, but he carried out his own. He did not intend to rule the Commonwealth, but only to use the opportunity to plunder it and perhaps seize some territories. Radziejowski, in the end, was arrested by him.

Radziejowski made two mistaken assumptions here, directly resulting from our theory. First, Karl Gustav has no interest in choosing what is beneficial for Radziejowski if another decision allows him to gain more and risk less. Second, if Radziejowski betrayed his previous lord, he does not qualify as a candidate for high offices, as his loyalty is suspect. Moreover, expecting gratitude for such services is naive. Neither will Karl Gustav face any negative consequences from someone who is held in contempt as a traitor, nor can Radziejowski do anything to him for it. Similar observations were made by Sienkiewicz, putting them into the mouth of Bogusław Radziwiłł:

> What happened here with the Swedes has never happened before in the world. We, sir, may sing: Te Deum laudamus!, but in truth, it is an unheard-of, unprecedented thing... How is it that an invader attacks a country, an invader known for its rapacity, and not only finds no resistance but also that everyone who is alive abandons their former lord and rushes to the new one: magnates, szlachta, army, castles, cities, everyone!... without honor, glory, shame!... History does not provide another example like this! Tfu! Tfu! Sir! The scoundrels in this country live without conscience and ambition!... And is such a country not to perish? They relied on Swedish mercy! You will have mercy! Already in Greater Poland, the Swedes are screwing

> the nobles' fingers into the locks of muskets! And it will be the same everywhere – it cannot be otherwise, for such a nation must perish, must fall into contempt and servitude to its neighbors!...

The above scheme is very important and is not limited only to high rank, fat purse, and other worldly benefits. Viktor Suvorov[23] wrote about the astonishment with which Soviet intelligence agents viewed various Western communists, ecologists, friends of the Soviet Union, and other progressive radicals. While enjoying all the goods of the Western world, they praised the Soviet Union to the skies and offered their services to the friendly officials from the Soviet embassy.

Someone could easily list many Western intellectuals who publicly praised Stalin, Che Guevara, or even Pol Pot, while refusing to believe reports of their crimes. So what might be going on with these kinds of people, whom the KGB probably didn't even try to bribe or blackmail? A quite good explanation is provided by E. M. Jones.[24], who outlines the case of the Cambridge Five spies and pointing out how sexual immorality fosters a need to find an alternative theory of moral happiness.

The story focuses on Anthony Blunt and Guy Burgess (and their betrayal for the USSR), as well as their social circles from their time at Cambridge.

Both Blunt and Burgess were high-ranking employees of British intelligence (Burgess was also a diplomat). From the 1930s to the 1950s, they served the Soviets as part of a spy ring that went down in history as the "Cambridge Five." They were representatives of the close elites of English society, which gave them access to careers in intelligence and diplomacy, and they were recruited during their studies at the University of Cambridge. Money was not involved (it is hard to bribe people who have almost everything), nor was the blackmail—the group simply believed that Soviet Marxism was the best political system. The slightly older Blunt took it upon himself to recruit the others, so he was, in a way, the mastermind of the operation.

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[23]Suworow, *[GRU: Soviet Military Intelligence] GRU: Radziecki Wywiad Wojskowy*

[24]Jones, *[Degenerate Moderns] Zdeprawowani Moderniści*

The network, having access to the darkest corridors of MI6 headquarters and the Foreign Office, caused lots of damage to Great Britain by stealing closely guarded secrets, the identities of spies, and secret diplomatic plans - and this state of affairs continued until Burgess's escape to Moscow in 1951. Blunt confessed only later, on the condition of immunity and keeping the matter secret for 15 years. During this time, he still enjoyed privileges such as a knighthood, the Royal Victorian Order, the position of Surveyor of the Queens's Pictures, and an honorary doctorate from Trinity College.

He said little about his motivations, apart from mention in a statement to the press that in a conflict between political conscience and loyalty to the country, he sided with conscience. That is, Soviet Marxism was a "matter of conscience". What that meant, Blunt did not say, but Jones reconstructed an answer by pointing to other authors who had experienced a similar infatuation with Marxism as Blunt, when "Cambridge changed overnight" under the influence of this ideology. Richard Crossman (p. 75) writes that"conversion to Marxism resulted from doubts about Western values, "greatly intensified by a Christian conscience". Intellectuals, who orthodox Christianity, still had acute pangs of conscience, he says. This is about some kind of "Christianity," interestingly. What is it? Arthur Koestler (p. 75) writes that before joining the Marxist party, he developed a strong disgust of the ostentatiously rich, not because they could afford lavish lifestyle..., but because they had no remorse when living it. In this way, Koestler made, as he himself says, a projection of his own plight onto the whole structure of society.

This is a very convoluted logic, which, however, becomes simple if we add two missing pieces. First, belief in communism guaranteed a kind of feeling of moral superiority, replacing earlier ethical systems. Endowed with a kind of sensitivity to social justice, Western socialists (a sensitivity that the bourgeoisie did not possess) felt doubly superior, not only because of their sensitivity to injustice, but also because of the means to the end, which was the construction of a red utopia modeled on the USSR. Sinclair wrote (p. 73) that Communists of the 1930's ascribed to themselves even greater moral superiority than others and that they were the heirs of Puritans as a harbingers of new heaven on a new earth.

There is also a second important reason why Blunt and Burgess could not find peace either in the Christian religion or in the prevailing morality: they were living very promiscuously, and this state of affairs had lasted since their studies at Cambridge or earlier. This was a very important feature of their entire circle of friends centered around the Bloomsbury Group (an informal association of artists) and the "Apostles" - a freethinking discussion group at Cambridge University. The writer Forster, the economist Keynes, the logician-philosopher Russell, and another writer, Strachey, were representative figures here. Some of them, including Blunt and Burgess, indulged in very compulsive homosexuality and even turned it into a kind of militant and subversive ideology. A strong sense of alienation was not difficult to achieve, as homosexuality was legally prohibited in Great Britain at the time and poorly tolerated even by freethinking elites (In 1895, the notorious conviction of Oscar Wilde for homosexuality was brought about by the Marquess of Queensberry, John Douglas, who was, incidentally, a militant atheist who lost his seat in the House of Lords after refusing, in outrage, to swear on the Bible).

The ideology idealized promiscuity, and especially homosexual promiscuity. John Keynes (p. 56) recounts that the group was greatly influenced by G. E. Moore's book "Principia Ethica," published in 1903, which was interpreted in a rather perverse way. "We accepted Moore's religion, so to speak, and discarded his morals. Indeed, in our opinion, one of the greatest advantages of his religion, was that it made morals unnecessary." The point is this: Moore indicates that the most valuable things we know include "the pleasures of human intercourse," which Keynes translates (or twists) as sexual relations, especially homosexual ones. As a result, these drives are, as it were, equated with aesthetic feelings and are classified as good and moral, which further means that they should be intensely satisfied. E. M. Jones also presents a number of intriguing remarks on how all this influences Keynes's economic doctrines, which present the consumption of resources as a good, but we will leave that topic. Let's return to the rest of the group, centered around our agents. In 1938, Forster wrote an essay entitled "What I Believe" (p. 67), where we read:

> I believe in aristocracy, though - if that is the right

> word, and if a democrat may use it. Not an aristocracy of power, based upon rank and influence, but an aristocracy of the sensitive, the con- siderate and the plucky. Its members are to be found in all nations and classes, and all through the ages, and there is a secret understanding between them when they meet. They represent the true human tradition, the one permanent victory of our queer race over cruelty and chaos.

Queer race is well-known ambiguous phrase used to describe, among other things, homosexual circles. At this point, the group already has a clear subversive political agenda - namely Soviet Marxism and effective methods of action, namely cooperation with Soviet intelligence. Interestingly, they did not pay attention to the fundamental discrepancy between Soviet Marxism and their ideological program: Stalin had no intention of agreeing to any sexual debauchery on his territory. A similar mechanism of denial, which made them see a criminal tyranny as heaven on earth.

Soviet utopian Marxism was a significant improvement on what the Bloomsbury group had previously adopted based on the perversion of Moore's ethics. The highest good of this ethic was aesthetic experiences (e.g., the modernist concept of "art for art's sake") and "communion with other people," i.e. promiscuous sex. Of course, the group indulged in this intensely and certainly had no intention of giving it up. At the same time, they were burdened by the emptiness of an ethical system that boiled down to pleasures here and now, without any vision for the future. Soviet Marxism could be neatly attached to the worldview and life attitude of the group, giving a radiant vision of heaven on earth and a feeling of moral superiority over the bourgeoisie and the uninitiated. Blunt and Burgess could therefore indulge, for example, in quick anonymous encounters in public toilets, which they "could not resist" (p. 69), and at the same time feel very moral thanks to their devoted service to a higher idea.

2 Teleological Theory of Language

2.1 Final Causes in Language

Understanding language depends on considering final causes, for example, guessing what intention of the speaker lies behind the spoken words. It might seem that simple concepts like "apple," "stick," "two" are merely sensory images, but understanding them is often based on intention. How else can we understand phrases like: "sit down, D!" (in Polish, where "dwója" = two, means a D grade), or "carrot and stick"? Teleological concepts are even more necessary for understanding complex phrases. Grice[25], in his famous article "Logic and Conversation," provided strong evidence of this phenomenon. Here is an example.

Example 2.1 *Mr. A. and Mr. B. are talking about a mutual colleague, Mr. C. A. asks, "How is Mr. C doing at work?" B. replies: "Quite well, he likes his colleagues and hasn't been to jail yet." Notably, B has just said a lot more than "Mr. C. is doing well" and "Mr. C. hasn't been to jail so far." To discover this, you have to ask* ***why*** *he said it. Maybe he wants to indicate that Mr. C.'s colleagues have some illegal business, maybe the job is very risky in terms of committing a crime, or maybe Mr. C. is known for dishonesty. Mr. B. knows, more or less, what A. knows about this subject, and this allows him to refer to some common information, so that Mr. A. can guess the allusion (also using information about what Mr. B knows and what he might want to achieve). If this condition were not met, Mr. B. would probably not have said something like that, knowing that such a joke could be misinterpreted (e.g., as slander).*

Here is another example from Grice:

Example 2.2 *One person says, "Harold Wilson is a great man," and another says, "The British Prime Minister is a great man." The logical meaning is the same (saying about the same person that he is something), but the sense is not necessarily the same. (In 1975, both sentences referred to the same person, because Wilson was the British Prime Minister in 1975).*

[25] Grice, "Logic and Conversation", p. 43

The meaning depends on the context. It could be, for example, that Wilson has certain special character traits or achievements: "The British Prime Minister is a great man, he became a member of the government at the age of 31," or another, that it is the office of Prime Minister that makes him great in some sense: "The British Prime Minister is a great man, he is invited to G8 meetings." An Aristotelian would say that in the first sentence we understand the Prime Minister accidentally (this particular Prime Minister entered the government very young), while in the second per se (the Prime Minister, by virtue of being Prime Minister, is invited). But how do we discern which meaning we are dealing with? We must discover the intention, by perceiving the ordering of words and the circumstances.

Here are two important theses of Grice on this subject. The first states that conversations between people are ordered with respect to a goal (p. 45).

Thesis 2.1 *"Our talk exchanges do not normally consist of a succession of disconnected remarks, and would not be rational if they did. They are characteristically, to some degree at least, cooperative efforts; and each participant recognizes in them, to some extent, a common purpose or set of purposes, or at least a mutually accepted direction."*

The second indicates that speakers generally adjust their behavior with respect to this goal:

Thesis 2.2 *(The Cooperative Principle) Speakers generally adhere to the principle of "Make your contribution to conversation such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged."*

He calls this principle the Cooperative Principle. It should not be assumed that these phenomena apply only to a small number of cases of language use: on the contrary, its nuanced use is very common. If I say, "There's a gas station 500 meters ahead" to a stranger who tells me he's just run out of windshield washer fluid, I mean not only the station, but also that it is currently open and they sell windshield washer fluid. If I were to tell him about a station that is closed, he would probably have reason to be angry with me, because I misled him, even though I didn't lie. If I say "There's a gas station 500 meters ahead" in response to the question "What's that green neon sign shining over there?", I mean and suggest that the sign is precisely the sign of the gas station. So we must constantly rely on final causes to read the subtle cues of the interlocutor. They can be really subtle, e.g. when the interlocutor gives us information that seems redundant (but is not at all). Here are two more of Grice's examples.

Example 2.3 *A professor is writing a letter of recommendation for a student who is looking for a job as a philosopher. He writes the following words: "Dear Sir, Mr. X has excellent command of English and regularly attended my classes. Sincerely." This has little to do with philosophy — why didn't he write that the student is (or is not) a good philosopher? Someone else might not know the answer, but the professor who examined him almost certainly knows it, and the recipient knows this, even from the information that he "attended my classes." It is also known that recommendations present the positive qualities of the candidate, while one should not lie. This suggests the opinion that the candidate is not a very good philosopher, which is also the true meaning of this note.*

The second example of a seemingly redundant statement is a tautology like "war is war," "women are women." A tautology is an obvious statement; that women are women and apples are apples is not new information. However, Grice points out, one should consider what purpose someone has in uttering one tautology rather than another. The sentence "Thousands of graves, tens of thousands wounded... once again convince us that war is war," for example, points to the loss of life in war, while at the same time possibly arguing that some contemporary war is as brutal as any other, perhaps contrary to more optimistic expectations.

A good example of a definition by final cause is the eye[26]: The meaning is given by the final cause, from which the form (the organization and alignment) follows. Meaning is not in how the eye is built, but what it is for. It might seem that this does not have to be the case. Like if we say "eye" looking at a specific human eye: it has

[26] Taken from (Fr. Reginald Garrigou-Lagrange, *The Order of Things: The Realism of the Principle of Finality*)

an iris, a lens, a pupil, and so on. The pupil is controlled by some very small muscles, and the muscles by corresponding nerves. The lens has certain dimensions, and so does the retina, on the back wall of which we find photoreceptors. All this is a form, telling us how the different parts of the eye are assembled and coordinated among each other. However, such a definition cannot be stated generally; it works only for this one particular eye. When we consider even the eye of the same person, when he is 2 years old and when he is 50, we will see that the dimensions change, so the form also changes. The eye, therefore, cannot be defined by a single form, but rather by a broad family of forms, and this complicates the definition significantly: it is not easy to specify whether something is an eye based on form alone (i.e., dimensions and organization) — e.g., there may be a close model of an eye that is not an eye, because it lacks photoreceptor cells and nerve connections. If we take the eyes of other people, differing in iris color and other aspects, the situation becomes complicated: a change in iris color does not make an eye cease to be an eye, but other changes in eye structure may or may not be significant.

We know, however, that answering what an eye is, is easy: the dictionary says "the round organ of sight in humans and vertebrates." That is, the eye is an organ for seeing — it is defined by the purpose of seeing. The dimensions of the lens, retina, and pupil are not given in millimeters, but are variable, always being just such that a sharp image of objects is formed on the back wall. The lens is transparent and deforms so that distant and near objects can be seen. If we replace this lens with an artificial lens, as is done in cataract surgery, or even a Fresnel lens — we will still be dealing with an eye, because the organ will still serve its purpose well. So the definition of the word "eye" by final cause is:

- very simple (it can be given in one sentence),
- elegant and optimal (there is nothing superfluous in it),
- highly precise (all the essential properties of the eye and the criterion for determining whether something is an eye follow from it)

and therefore the only correct and usable one. Achieving the same properties on the basis of a formal definition, a description of dimensions and components, is impossible. We can find many other examples: ear, tooth, leaf, seed, armor, cup, pen, mine. All of these can be easily defined by final cause and cannot be defined in any other way.

2.2 Errors of Neopositivism in the Theory of Language.

Having explained the role of final causes in the theory of language, recognized in philosophy from antiquity to the present day, we will also become acquainted with a strange theory of language that completely undermines and rejects this role (in fact, it undermines much more, but more on that in a moment).

We are talking about the neopositivists, or the Vienna Circle, who proclaimed various versions of the thesis that sentences that cannot be "empirically verified" are "nonsense." The program was based on the philosophy of Frege and Wittgenstein, at least so to speak, because successive iterations were increasingly distant from the original.

Frege, in his 1892 article "On Sense and Reference"[27], made an influential logical analysis of language. Here is a sketch of his theory. Imagine the sentence: "Sienkiewicz is the author of Quo Vadis." The author of Quo Vadis and Sienkiewicz are one and the same person. We might therefore think that some "logical sense" should be preserved if we replace "The author of 'Quo Vadis'" with "Sienkiewicz" in the sentence. However, this does not work, since we get the sentence "Sienkiewicz is Sienkiewicz", A is A. The original sentence was "A is B," and it conveyed some knowledge about the world.

Frege believes that for words, there is separately a "reference" (i.e., an object: a person, Henryk Sienkiewicz, a writer who died in 1916), and separately a sense (i.e., a thought, such as the object in context: the author of Quo Vadis, the Nobel laureate of 1905, etc.). The reference of a sentence, Frege further believes, is its truth value, i.e., the value 1 if the sentence is true and 0 if it is false. Frege, however, does not cut himself off from final causes in language; he writes directly that he omits the question of establishing reference,

[27] Frege, "[Sense and Reference] Sens i znaczenie"

which is crucial for us, and that intention must be indicated to justify speaking of reference.:

> Idealists or skeptics will perhaps long since have objected: "You talk, without further ado, of the Moon as an object; but how do you know that the name 'the Moon' has any reference? How do you know that anything whatsoever has a reference?" I reply that when we say 'the Moon,' we do not intend to speak of our idea of the Moon, nor are we satisfied with the sense alone, but we presuppose a reference. To assume that in the sentence 'The Moon is smaller than the Earth' the idea of the Moon is in question, would be flatly to misunderstand the sense. If this is what the speaker wanted, he would use the phrase 'my idea of the Moon'. Now we can of course be mistaken in the presupposition, and such mistakes have indeed occurred. But the question whether the presupposition is perhaps always mistaken need not be answered here; in order to justify mention of reference of a sign it is enough, at first, to point out our intention in speaking or thinking. (We must then add the reservation: provided such reference exists.)

Frege finds that swapping terms with same reference but different sense preserves truth-value. "Sienkiewicz died in Switzerland" is true and "The author of 'Quo Vadis' died in Switzerland" is true as well, and same happens for any similar sentence and transformation. He cannot however generalize this principle to be able to swap subordinate clauses:

> It is hard to exhaust all the possibilities given by language; but I hope to have brought to light at least the essential reasons why a subordinate clause may not always be replaced by another of equal truth value without harm to the truth of the whole sentence structure. These reasons arise:
>
> (1) when the subordinate clause does not stand for a truth value, inasmuch as it expresses only part of a thought; (2) when the subordinate clause does stand for

> a truth value but is not restricted to so doing, inasmuch as its sense includes one thought and part of another.

"I am hungry, so I'm going for a kebab" does not have the same sense as the version with the subordinate clause replaced: "I am hungry, so I'm going for a swim." Some additional rules would be needed, concerning what can be substituted for what.

How does sense (thought) relate to reference (the truth value true/false)? Frege believes that we move from thought to truth value through judgment:

> When we found 'a = a' and 'a = b' to have different cognitive values, the explanation is that for the purpose of knowledge, the sense of the sentence, viz., the thought expressed by it, is no less relevant than its reference, i.e. its truth value. If now a = b, then indeed the reference of 'b' is the same 'a', and thereby the sense expressed in 'a = b' differs from that of 'a = a'. In that case the two sentences do not have the same cognitive value. If we understand by 'judgment' the advance from the thought to its truth value, as in the above paper, we can also say that the judgments are different.

Nothing here yet that would suggest what we would call neopositivism. Final causes are relevant for our thoughts, judgments, intentions; and Frege seems aware that these parts are not subject to simple logical analyses. Frege also did not share the program of attacking metaphysics and religion. On the contrary, while the positivists were a group of socialists and militant atheists, Frege was one of the last people who could support them, being a Prussian monarchist, conservative, anti-Semite, and enemy of socialists. In philosophy, he is mainly remembered for his program of building the foundations of mathematics on logic.

Another important figure on the list is Wittgenstein, with his book Tractatus Logico-Philosophicus, published in 1918, and his second, Philosophical Investigations, published in 1952. The first book introduces the theory of mapping language into a certain logical schema; the second completely breaks with the idea of the first, pointing out a number of its problems. These problems, in turn, can be solved by referring to final causes, the great absentees of both of Wittgenstein's theories. This silence allowed him to proclaim that the only true meaning of sentences can be found in everyday language and that all philosophy is a collection of linguistic pseudo-problems, e.g.[28].:

> The results of philosophy are the uncovering of one or another piece of plain nonsense and of bumps that the understanding has got by running its head up against the limits of language. These bumps make us see the value of the discovery.

His earlier promoters, incidentally, were not thrilled with this turn of events. Here is Russell's opinion[29]:

> The earlier Wittgenstein, whom I knew intimately, was a man addicted to passionately intense thinking, profoundly aware of difficult problems of which I, like him, felt the importance, and possessed (or at least so I thought) of true philosophical genius. The later Wittgenstein, on the contrary, seems to have grown tired of serious thinking and to have invented a doctrine which would make such an activity unnecessary. I do not for one moment believe that the doctrine which has these lazy consequences is true. I realize, however, that I have an overpoweringly strong bias against it, for, if it is true, philosophy is, at best, a slight help to lexicographers, and at worst, an idle tea-table amusement.

It is worth focusing more closely here on the Tractatus, seeing such superlatives about it. The Tractatus, then, was supposed to provide a theory of the meaning of language based on logical analysis. Here is a sketch of its ideas from the Stanford Encyclopedia of Philosophy[30]:

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[28] Wittgenstein, *Dociekania Filozoficzne [Philosophical Investigations]*, p. 74

[29] Verschuren, *What Does It Look Like? Wittgenstein's Philosophy in the Light of His Conception of Language Description: Part I*, p. 8

[30] Proops, "Wittgenstein's Logical Atomism"

> (i) Every proposition has a unique final analysis which reveals it to be a truth-function of elementary propositions; (ii) These elementary propositions assert the existence of atomic states of affairs (3.25, 4.21); (iii) Elementary propositions are mutually independent — each one can be true or false independently of the truth or falsity of the others.

Roughly speaking: a truth function is logical functions combined with each other in any combination: AND, OR, NOT, etc., similar to a programming language. If "(The cat eats food)", "(The horse jumps over the fence)", "(The dog wags its tail)" were elementary propositions, then "(The cat eats food, or the dog wags its tail and the horse does not jump over the fence)" is a complex proposition. The truth or falsity of the entire complex proposition then follows from the truth values of the elementary propositions. Elementary propositions, in turn, are supposed to be composed of simple symbols, i.e., names, and names are supposed to correspond to simple objects, of which atomic states of affairs are composed.

This theory is sometimes called the "picture theory of meaning," and a lot of typically teleological sentences and terms, which are essential for everyday language use, are beyond its scope. One might at first expect that such a simple language could at least express images composed of physical objects, for example, "the glass is on the table," and that it is beyond its scope to determine why we call something a glass and not a vase. But even this simplicity is illusory. Even simple sentences about physical states of affairs may not satisfy condition (iii), not being mutually independent. "The glass is empty and the glass is full," "I ate a hearty breakfast and I haven't eaten anything since yesterday," "The button is all metal and the button is all wood" — these are examples of contradictory sentences, which do not correspond to any states of affairs, so their components cannot be considered independent elementary propositions. Wittgenstein was therefore never able to determine how elementary propositions are formed. W. Sady (a supporter of Fleck, about whom later) summarized it as follows[31]:

[31] Sady, *Wstęp do Dociekań filozoficznych [Intro to Philosophical Investigations]*

> While writing the Tractatus, Wittgenstein was unable to give examples of names or to determine how names combine into elementary propositions: perhaps these propositions should have the form aRb (a is in relation R to b), perhaps abcde (where a,...,e are individual names, then the elementary proposition would directly resemble a picture), or perhaps some other form. But at least it was known that on the "second level" of the logical structure of language (and the world), a proposition is a truth function of elementary propositions in the sense perfectly known from logic. Now, from the perspective of "Some Remarks on Logical Form", even this was no longer known: some additional conditions had to be imposed on the formation of compound propositions, but what they were, there was no way to determine.

It was not known what elementary propositions are in general, but it seemed that overcoming this difficulty would reveal a theory of language. The problem, however, turned out to be difficult, and other problems arose as well. It is a rather peculiar turn of events, when Wittgenstein set himself the goal in the Tractatus of separating everything that can be reasonably said; beyond this limit lie, for example, as nonsense, philosophical theses. But at the same time, the theory was so full of holes that typical everyday language use could just as well be nonsense; incidentally, while being flawlessly and unambiguously understood even by small children. From the scientific side, Karl Popper noted in 1933[32] that Wittgenstein and the positivists, wanting to eradicate metaphysics, also "prove" the nonsensicality of scientific statements.

> The positivists, who are so eager to annihilate metaphysics, annihilate natural science along with it. For scientific laws, too, cannot be reduced to elementary statements of experience.

Dealing with this issue in detail fell mainly to the neopositivists, also called the Vienna Circle, while Wittgenstein withdrew from

[32] Popper, *Logika Odkrycia Naukowego*, p. 30-31

philosophy for a longer time after 1921. In connection with this, another snag appeared. The neopositivists appropriated the Tractatus without worrying at all about the original meaning of this rather mysterious book. Here is another comment by W. Sady[33]:

> Logical analysis, therefore, divides sentences in the grammatical sense disjointly (but probably not exhaustively) into three groups: 1) meaningful sentences, showing a possible situation and saying what is the case, and depending on what is the case, true or false; 2) meaningless theses of logic and mathematical equations, always true (or false), showing the logical form of reality, but saying nothing; 3) absurdities, which neither show nor say anything. And that's all the logical positivists read from the Tractatus Logico-Philosophicus. After which they added to this the theory that metaphysical texts are a clumsy and deceptive way of expressing certain emotional states, the emergence of which is explained by psychology. At this point, they distorted the basic idea of the Tractatus as completely as it could be distorted. Here is what Wittgenstein himself said to Schlick and Waismann on December 30, 1930:
>
> "I perfectly understand what Heidegger means by being and anxiety. Man feels the urge to run up against the limits of language. Think for example of the astonishment that anything at all exists. This astonishment cannot be expressed in the form of a question, and there is also no answer whatsoever. Anything we might say must, a priori, be nonsense. (...) It is this running up against the limits of language that is ethics. It is that all this talk about ethics is a running up that matters – whether there's such a thing as ethical knowledge, whether there are values, whether the Good can be defined, and so on. (...) But the tendency, the running up, points to something."

[33]Sady, *WSTĘP DO TRAKTATU LOGICZNO-FILOZOFICZNEGO, Wittgenstein. Życie i dzieło [Intro to Tractatus Logico-Philosophicus - Wittgenstein: Life and Work]*

> If metaphysics is a collection of absurdities, these are not ordinary absurdities. For these absurdities, people leave their families and set out on pilgrimages or enter monasteries; for these absurdities, they are sometimes ready to give their lives. And no one would give a broken penny for a sentence about colorless green ideas sleeping furiously. Something must be behind all this, and something extremely important.

Wittgenstein is supposed to be the author of some approach to ethics, which denies that anything can be said about it, but not that it exists. Neopositivists cannot be accused of similar sophistication; moreover, it is clear that their main goal is to eradicate traditional religion and philosophy and replace it with militant scientism, of which in a moment. Popper writes about this[34], pointing out that earlier Mill and Comte used the word "meaningless" in a similar sense (which justifies the common name "positivists"):

> Positivists... believe that they must strive to discover a certain difference... between the empirical sciences on the one hand, and metaphysics on the other. They invariably try to prove that metaphysics is merely empty, nonsensical chatter...

Indeed, this is the opinion of the neo-positivist manifesto, entitled "The Scientific Conception of the World"[35]:

> The scientific world-conception knows no unsolvable riddle. Clarification of the traditional philosophical problems leads us partly to unmask them as pseudo-problems, and partly to transform them into empirical problems and thereby subject them to the judgment of empirical science.

This modest tone, claiming the right to pronounce final *strictly scientific* statements is quite characteristic of neo-positivists and

[34] Popper, *Logika Odkrycia Naukowego*, p. 29

[35] Otto Neurath, *[Scientific World View] Światopogląd Naukowy, tłum. M. Skwierciński, w: Hanna Buczyńska; Koło Wiedeńskie. Początki neopozytywizmu*

scientism advocates. One of the best-known and most characteristic publications of this trend is Carnap's "The Elimination of Metaphysics Through Logical Analysis of Language"[36], in which the author attacks metaphysics and particularly Martin Heidegger, about whom there is no need to say much here; what matters more is what the positivist has to say.

Firstly, he claims the authority, thanks to the "advances of modern logic," to determine the sense of specific words or sentences, without consulting the opinion of those who use them, and without regard for Frege's remark that logical analysis does not provide such answers. However, almost no one uses language based solely on logic, or any other set of explicitly stated rules. Rules can arise spontaneously between two rational beings who are trying to communicate. It is impossible to assume that they will always be the same; even for the same two interlocutors. The author cites the sentence "Caesar is a prime number" as an example of nonsense, but this does not mean that one cannot assign a human to a number in a meaningful way. A similar, but realistic, example would be "Tom is number 4," generally not meaning that Tom is a number, or a multitude, but, for example, that Tom plays soccer in a team the number 4 (where the facts that he plays soccer and has a 4 on his jersey generally follow from the purpose and context of the utterance), or that Tom is the fourth-best player on the team.

Secondly, there often is no isolated meaning of individual words and sentences, but this does not mean that they are nonsense. We saw already examples in natural language that the meaning of a complex sentence is not simple logical function subordinate clauses. I recently mentioned syncategorematic infinity, which is the foundation of Cauchy's calculus[37]. Infinity of this sort is not a number or a quantity, but rather a succession of values increasing indefinitely. In physics, the object of study is often not directly verifiable experimentally. It is impossible to see an electron in any way, as it is too small to reflect light. We can see a trace on a cathode-ray tube, but that is not an electron itself, but rather bunch of photons originating from the excitation of some other atoms. The

[36] Carnap, "The Elimination of Metaphysics Through Logical Analysis of Language"

[37] Zawistowski, *Differential Calculus made clear (by its original inventor): Cauchy's theory of infinitesimals*

dot on the CRT obviously cannot be a criterion for verifying the existence of an electron, because it could just as well be caused by some other effect. Only by interpreting many results can we discover the general laws governing electrons and, on the basis of these, draw the conclusion that such particles exist. Therefore, what Einstein[38] and Duhem said is true, that individual physical concepts are arbitrarily adopted conventions, which are confirmed only all at once within the framework of the entire theory and the theoretical interpretations of the experimental results that confirm it.

Thirdly: teleological concepts appear constantly in everyday language, not only as aids in determining the meaning, but also as foundational to the meaning itself. What else does "the defendant deliberately damaged the installation," "I am writing a book on philosophy," "we are building a fishing boat here," etc., mean, if not the ordering of actions towards a certain effect? Here is what A. N. Whitehead wrote on this subject in 1929[39]:

> The conduct of human affairs is entirely dominated by our recognition of foresight determining purpose, and purpose issuing in conduct. Almost every sentence we utter and every judgment we form, presuppose our unfailing experience of this element in life. The evidence is so overwhelming, the belief so unquestioning, the evidence of language so decisive, that it is difficult to know where to begin in demonstrating it. For example, we speak of the policy of a statesman or of a business corporation. Cut out the notion of final causation, and the word "policy" has lost its meaning. As I write this lecture, I intend to deliver it in Princeton University. Cut out the notion of final causation, and this "intention" is without meaning. Again consider the voyage of the battleship Utah round the South American continent. Consider first the ship itself. We are asked to believe that the concourse of atoms, of iron, and of nitrogen, and of other sorts of chemical elements, into the form of the ship, of its armour, of its

[38] Zawistowski, *Order and Contingency*, s. 116
[39] Whitehead, *The Function of Reason*, s.9

> guns, of its engines, of its ammunition, of its stores of food,—that this concourse was purely the outcome of the same physical laws by which the ocean waves aimlessly beat on the coasts of Maine. There could be no more aim in one episode than in the other. The activity of the shipbuilders was merely analogous to the rolling of the shingle on the beach.

Since the time of Socrates even a half of philosophy concerns itself with human nature and human affairs. Such philosophy, necessarily relying on similar final cause formulation, cannot be overthrown without biting common sense at the same time. The other half can only be attacked by simultaneously attacking physics, which we will discuss in more detail in the section on the positivists' attitude towards physics.

2.3 The Teleological Origin of Language

A key observation of Grice is Thesis 2.2 —speakers must proactively cooperate with each other towards a common goal for the conversation to succeed. Such behavior can also cause groups of people who do not know a common tongue to create a rudimentary language allowing them communicate. Definition of meanings through final cause also allows to establish new phrases. European languages do not have many traces of such formation, so it does not seem to be common —nevertheless, it is certain that something like this can happen. It has happened wherever groups of people without any common language had to communicate: this is how pidgin languages, such as Tok Pisin or Russenorsk, came into being.

Moreover, in a similar way, using this principle, we can teach someone a foreign language if that person does not know any other language understandable to us. Examples include language courses of the French Foreign Legion, where recruits from dozens of different countries, often without knowledge of any European language, learn to speak French within a few months, speaking only and exclusively in French during this time. Words are thus learned through repetition, after which their translation and use are shown through examples.

In Papua and nearby, there is a language called Tok Pisin, which from our point of view is a fascinating creation, as it reveals to us the concepts we are discussing here. This language is composed of a small number of typically English phrases, which have been creatively converted into new words: thanks to this, a small number of English-language source words can express a large number of concepts needed in conversation. This allowed Papuans to communicate with the English, adopting only a small part of their language.

For example, elbow in Tok Pisin is called “skru bilong han” (screw-of-hand, i.e., screw of the hand). Knee is called “skru bilong lek” (screw-of-leg) and also “skru” itself means knee. Hair is called “gras bilong het” (grass-on-head). All these words use word “belong”. Hospital is “haus sik” (sick-house), bank is “haus moni” (money-house). Also, some English words acquire new associated meanings, due to the limited vocabulary. For example, “hevi” is not only (heavy), but also weight. “Vot” is not only (vote), but also elections.

We may notice that implied sense, the same thing that Grice describes in the situation where, in response to the statement ”I’m out of gas,” we respond ”There’s a garage around the corner” (implicitly suggesting that the garage is open and you can buy fuel there) also occurs in understanding Tok Pisin by a person who knows English. Hearing ”vot,” I don’t know if it’s about elections or the act of voting, but from the context of the sentence, it can be deduced, so making the explicit difference is superfluous. Hearing “skru bilong han” (screw of the hand), a person speaking English can understand that while the hand has no screws and in reality, it is about the elbow. It is even easier if we see how our partner is trying to communicate knowing a limited vocabulary of English words. This is precisely how Thesis 2.2 works here.

We will probably not find out where and when the first group of islanders learned some English terms, having encountered a group of Englishmen. It is certain, however, that although they did not know a single common word at the beginning, they nevertheless understood something among themselves. Signs and gestures expressing at least satisfaction or approval, as well as dissatisfaction and disagreement, are generally similar, because people are similar to each other. If we look in the mirror and force a smile, we feel that there are some positive feelings associated with it, and if we make a sad face, we feel the opposite. In this way, two people from opposite ends of the world can transmit a signal "yes," or a signal "no." People can also show each other things by pointing at them with their hand or finger —of course, one would have to wonder why this gesture would be understandable to newcomers from the ends of the earth. Pointing at something with a finger is different from, for example, the raising of a finger in the air saying that "the matter is very delicate and one should proceed cautiously and without haste," although the movement of the hand is more or less identical. Showing is different, however, as the face, eyes (thanks to the whites of the eyes we can see which way they are turned) indicate the same direction as the fingers. The eyes are for us an even more important clue, because thinking that other people are similar to us, we can infer that the eyes indicate what these people are looking at. And pointing with the hand is an additional signal to let us know that we should also look there (because the eyes and hand are coordinated *for a reason*. Thus, teleological cause is necessary not only in understanding words but also other signs.

In this way, a few Englishmen and a few Papuans can teach each other a few words understandable to each other. One Englishman, pointing to himself and his interlocutor, can explain to him the words "you" and "me." Using sticks and stones, he can explain a few numerals, like "one," "two," "three." "One, two, three" we can show on three fingers, three sticks and three stones —making the interlocutor understand that none of these words describes the stones themselves, nor the sticks themselves. Sooner or later, he will guess the numerical abstraction and confirm with us that he understands it correctly, taking, for example, a few clam shells and showing "three" on them.

2.4 The Final Causes and the Use —the Errors of the Later Wittgenstein

The *Tractatus Logico-Philosophicus* made Wittgenstein a star of progressive philosophers, securing him a professorship at Cambridge (1939) and other benefits. Wittgenstein himself, however, in the 1930s abandoned the theory of the *Tractatus* in favor of a completely different one. Here are some of the theses presented in the posthumously published *Philosophical Investigations* (1952):

- The meaning of a sentence is determined by the way it is used (meaning is use).
- The only meaning of language is that which occurs in ordinary language (ordinary language theory).
- In general, different meanings of one word do not have a common part, but only each is similar to some other meanings (family resemblance).

The contribution of the *Investigations* is the refutation of the *Tractatus* by pointing out a long list of examples (or: listing a list of unrelated remarks and examples for which the theory of the *Tractatus* just doesn't work). The picture theory of language from the *Tractatus* is wrong and any other similar theory will be wrong, since it is impossible to give a general logical form of the sentence. According to the author sentences are different forms of sentences in ordinary language and these forms extrapolated beyond their area of application lead to absurdities and ambiguities, which is, according to the author, the set of pseudo-problems that philosophy deals with.

Reading these examples, however, it is striking that Wittgenstein, both in the *Tractatus* and in the *Investigations*, cannot for the life of him get the teleological cause down. He somewhat indicated a similar principle "meaning is use," but did not mention that in every use there is a *purpose, why something is done*. What is the difference between "use" and "purpose"? "Use" in the author's understanding refers to what actually happens, and "purpose" refers to the foreseen or expected consequences in the minds of the speakers. "Use" refers to one turn of events, "purpose" to the multitude of those that can hypothetically happen, and without which it is impossible to understand what is actually happening.

Suppose I am playing chess. My opponent quickly captures my rook and knight and uses the advantage to defeat me in 20 moves. Was the meaning of my moves, which allowed him to do this, the actual result, i.e., my defeat? Or did I play so badly that I didn't notice this? For a competent player, it is usually quite different: he must sacrifice pieces to neutralize more important threats at the moment, or to develop his own attack plans. The fact that neither one nor the other may work for him in a game against a stronger opponent certainly does not negate the fact that he gave up the pieces precisely for that purpose. For the meaning is the purpose, not just the use. And Wittgenstein, therefore, is constantly maneuvering to avoid showing that thought, prediction, and cooperation lie behind language.

The examples he gave are not subject to "logical analysis," but they can be explained by considering the purpose of the utterance, and what's more, in combination with the context of the utterance and the knowledge of the interlocutors, this meaning is unambiguous, as we will show shortly. Appealing to ordinary language does not guarantee us anything like that, because ordinary language is also not a unity, nor does it provide a way to assign meanings to sentences.

2.4.1 Ostensive Definitions

The first few paragraphs of the *Investigations* deal with ostensive definitions of words (by pointing), suggesting that these definitions do not work. (PI 2[40]) They point out a situation (a "language game," says the author) where two builders communicate like this: one of them (A) shouts "brick," "block," "pillar," "beam," and the other (B), upon such a spoken command, brings him these things. It would be a problem here to assign the meaning of the word "brick" to the image of a brick, or a real brick —because this term can be used differently.

One can also point out another, more general problem of ostensive definition: it does not distinguish between a specific brick, an image of a brick in the mind, and the category "brick" (containing all types and examples of brick). The first is a material thing, and the last two are some kind of ideas, following from final causes. Neither the material (ceramics, concrete, dried clay, ice, etc.) nor the shape of the brick (e.g., a triangular or curved element of an arch) determines such an idea; it can only be reconstructed from the purpose for which the brick serves: the building material, to erect walls and structures.

[40]Wittgenstein, *Dociekania Filozoficzne [Philosophical Investigations]*, paragraph 2 —I will use a simplified citation format

The translation of the shout "brick" into the action "bringing someone a brick" can also be explained by purpose and intention. The context of the situation, or earlier conversation between the companions, allows one to guess the correct intention of the utterance. If a builder is just putting up a wall on the upper floor and shouts "bricks" or "mortar" to his companion, the companion can guess that he is to provide him with bricks or mortar. This is also an application of another of Grice's principles, that people optimize against saying obvious things.

Selection of such a form of utterance is also a matter of purpose: in a noisy environment, or when we must hear each other at a distance, yelling single words is more effective than speaking grammatically correct sentences. The details of the latter will not be heard well anyway. Moreover, the difference between "could you bring the bricks" and "bring the bricks" is not as significant in the described situation as the difference between "bring a brick" and "bring mortar" —because the intention differs.

2.4.2 "Meaning is Use" as a Final Cause and Without It.

In the following paragraphs, the author describes a situation: worker A can shout "slab A," "slab B"[41] to refer to one of two types of slabs. For example, a bricklayer has gray and red slabs at his disposal and is to use them to lay a certain planned pattern when building a wall. Then the author talks about the use of the words here-there, e.g., "Slab A-here," "Slab B-there." In (PI 10), he concludes that the meaning of sentences and words is determined by their use.

But what does the statement "The meaning of sentences is determined by their use" mean? Our experience of speaking is generally like this: we have the thought that uttering such and such words will cause some foreseen effects. We assume the interlocutor will understand something and possibly do something, and through this, we choose words, tone, and utterances. This means that the meaning of consciously spoken sentences is determined by the final cause. Of course, we do not say everything rationally and

[41] Originally "slab"

consciously; impulses of emotion and habits also play a role; but language as a means of communication is used rationally.

How exactly can the term slab A be associated with a gray, concrete slab, and slab B with a red ceramic slab? Grice pointed that conversation is made by two agents seeking to communicate. The terms "slab A," "slab B" in a real situation do not arise in a vacuum, but rather are used when they refer to some information that both people possess and that can allow understanding. For example, the gray slab came in a delivery marked A, and the red slab in a delivery marked B —then "A," "B" naturally become understandable terms for distinguishing the two types.

A similar thing happens with the words "here" or "there." By themselves, they can indicate different places: "here" only indicates places closer than "there." On the other hand, the context of the situation and the intention make "here" and "there" have a specific meaning and appear in the sentence for a planned reason. One is the economy of language, e.g., I say "the Legia vs. Lech match is there" instead of "Legia vs. Lech match is in Warsaw at Łazienkowska Street," if my interlocutor already knows where this usually happens. Moreover, "there" as an empty indicator of place can be added to a sentence to emphasize the importance of location. For example, there is a difference between the sentence "The Legia match is there." and "There is a Legia match." In the first sentence, I am pointing out the location to my interlocutor: e.g., I am suggesting something like "At a specific time, let's pay attention to this particular area, and not another."

So even the word "there" used without additional information is not without meaning, although it is problematic if we adopt the picture theory of meaning. Sometimes it is used with accompanying gestures: pointing with a finger or eye movement. For example: "look there," I say, pointing out a plane to my friend with my finger. Here, too, the game-theoretic aspect of understanding each other is visible. The word "there" draws the colleague's attention to the location (this is the difference between "Look there" and "look"). He must guess for himself what location it is, knowing that there will be some other clue, since I have already revealed the intention to indicate the location.

2.4.3 Colors, Numerals, Lengths

In (PI 29), we find the objection that there are no ostensive definitions for colors, for numerals, and for lengths. This is a very apt objection, indicating that limiting language to "things," "facts," and the like is an artificial requirement that cannot be adhered to when speaking freely on any subject. At the same time, clear definitions can be given and linked to words using final causes. We mentioned earlier, in the example of Tok Pisin, that you can explain a few numerals to someone by showing them on sticks, or stones, or other objects. Even if our interlocutor does not know a word in a language understandable to us, he will understand our words by trial and error, if only he has the intention to communicate with us and accepts the hypothesis that we also have such a goal. The numeral, like "three," is what connects three stones, three sticks, and three shells, and at the same time, what arises when "two" and "one" are added together. We can show all this with examples, in accordance with the earlier thesis of Aristotle[42] that arithmetic is also learned by everyone from the relations occurring among objects. Similarly, for example, the color red can be given by listing red things (and assuming that the interlocutor will perform a rational abstraction).

2.4.4 "The Chess King" Defined by the Purpose it Serves.

In (PI 31), Wittgenstein gives an example similar to what I described in the case of the eye, justifying the definition that it is an organ used for seeing.

> If one shows someone the king in chess and says: 'This is the king', this does not explain to him the use of this piece —unless he already knows the rules of the game up to this last point: the shape of the king's piece.

We understand the chess king as a piece for playing chess; and that is its useful definition. The appearance of the king is not clearly established, and one can buy pieces in various shapes. And I could just as well play chess having only pieces of stones at my disposal.

[42] Zawistowski, *Order and Contingency*, s. 25

So I can decide that flints will serve as pawns, amethysts as rooks, and a piece of quartz will be the king. I can then say to my friend, "this is the chess king," and we can play chess like that, even though the king will not resemble a figurine from a store at all.

Similarly, games are defined by some goals. Firstly, in chess, the goal is to capture the king before the opponent captures ours. Secondly, chess also exists for a reason, providing entertainment and some intellectual benefits. Relatively simple rules are enough to create a large number of game combinations (so you can play it for a long time without boredom), moreover the game allows you to demonstrate strategic thinking, because you have to anticipate the opponent's moves many moves ahead. Variants of this game that have arisen in modern times are also interesting. In one interview, Robert Fischer (one of the most outstanding chess players in history) stated that he hates chess, because with the professionalization of the discipline, the development of theory and the use of computers, success is increasingly determined by memorization and the opening setup[43], and not creativity. Wanting to fix these problems, he also designed his own variant of chess called "Fischer Random" —it differs from ordinary chess mainly in that the row of pieces is randomly shuffled. Such a game is almost identical to old chess (so any chess player is able to understand it quickly), but creativity is more important due to the uniqueness of the initial configuration.

This is how games evolve. Answering the problem of where we get the concept of a piece, one can answer similarly: a primitive game can arise from some kind of agreement like "the rules are such and such, if one thing happens (I win) you give me a coconut, if another happens (you win) I give you a coconut." Someone, for example, could easily explain to someone the game of three cards without even knowing a common language (as in the comedy "How I Unleashed World War II Part 2") —reveal where the red card is —you win. Reveal a black card —I win. Similarly, a simple board game like the Indian game Pachisi (similar to the game called "Ludo") or the Royal Game of Ur (a board game resembling a race) dated to over 4400 years ago can be created.

[43]Fisher, *Bobby Fischer on Paul Morphy and how opening theory destroyed chess*

Wittgenstein makes another simple oversight relating to the example of chess in (PI 200), posing the question of whether we could get to know people from other cultural circles if, for example, they did not behave like us, but shouted and stamped their feet. They could just as well put on colorful costumes made of leaves, drink agave alcohol with each move, or proceed in a similar way as in the sport called chess boxing. Instead of pieces, they can use differently marked pieces of rock and coconut shells. Will we recognize chess then? If chess is indeed chess, then we will see the ordering of the movements of the pieces (diagonally, horizontally, two forward and to the side), the rules of capturing pieces, the rules of the end of the game, and others; we will see and predict the ordering with respect to the goal, because that is the definition of chess. Without reference to purpose, and only indicating use, it is impossible to define chess. To see this, consider, for example, a group of children that mimics chess players by playing one learned pattern over and over again and not thinking about it. Or perhaps two people, who want to show off by playing blitz chess, but in reality, they are playing out an established, planned scenario. They use the pieces the same way as chess players, but they are not playing chess. e the pieces the same way as chess players, but they are not playing chess.

2.4.5 Abandoning Final Causes Leads to Further Pseudo-Problems.

The above discussion allows us to confront another problem, important to understand the anatomy of the pseudo-problems in which the author gets bogged down.

> Consider also this case: I am explaining chess to someone, and I begin by pointing to a piece and saying: "This is the king; it can move like this, ... , etc.". — In this case we shall say: the words "This is the king" (or: "This is called 'the king'") are an explanation of the word only if the learner already knows what a piece in a game is. That is, if he has already played other games, or has watched other people playing "with understanding" — and similar things. Furthermore, only

> then will he be able to ask during the learning of the game, appropriately: "What is this called?" — namely, this piece in a game.

Nobody needs to "already know what a piece in a game is" in advance to ask for clarification about "what is this called". The question "what is a piece in a game" is only a special case of the question about the purpose for which something is ordered and understandable, the same question we asked at the beginning of this book. Why is this whole system, conventionally called pieces on a board, moving in a predictable and orderly way —that is what we are really asking. We see that there is a purpose, there is a set of rules, and we ask what it is. It doesn't matter whether we are observing pieces on a chessboard, or pictograms in a window of a chess program, or people dressed as horses and pawns on a large chessboard, or a series of moves written on a few pieces of paper, as is the case in correspondence chess. All these situations are connected by the purpose and the way of ordering: and that is what is hidden under the name chess. A piece, therefore, does not mean a carved piece of wood in the shape of a horse, but a piece that stands in relation to other pieces, according to some rules of some game.

2.4.6 "To Think" is Not Only to Talk to Oneself, But Also to Reason About the World.

In (PI 32), the author writes as follows:

> A foreigner coming into a strange country will sometimes learn the language of the inhabitants from ostensive definitions that they give him; and he must often *guess* the meaning of these definitions; and sometimes he will guess right, sometimes wrong. And now, I think, we can say: Augustine describes the learning of human language as if the child were a foreigner coming into a strange country, not understanding the language there; that is, as if it already had a language, only not this one. Or again, as if the child could already think, only not yet speak. And "to think" would here mean something like: to speak to oneself.

I believe that "to think" in this context does not at all mean "to speak to oneself," nor is knowledge of any language necessary to learn another. For we think about the surrounding reality also by guessing its ordering, and on the basis of this ordering we can also learn language. For example: I could stand and observe a situation in a Chinese market for a long time. Even if I didn't know Chinese and was ignored by the locals, the order and predictability of what I see would allow me to guess certain rules of interaction. For example, the phrase "Shi-yen" is associated with a blue 10 yuan banknote, and "gan-shu" with a sweet potato. We understand and think by remembering images and sounds, comparing them to what we see and hear, and devising abstractions according to which human communication is ordered and predictable. Thus, it does not seem that thinking needs prior knowledge of language.

2.4.7 "X did not exist"

In (PI 79), Wittgenstein deals with the problem of the meaning of a sentence like "Moses did not exist" and points out that when uttering the name of a historical figure, e.g., "Moses", we can mean different things: "The man who wrote the Torah", "The man who led Israel out of Egyptian captivity", etc. One can choose any set of information about Moses, state that they are false or true (or true, but not in reference to a man named Moses) and further conclude that in some sense Moses did not exist, while he existed in another.

This is, Wittgenstein writes, Russell's opinion, that we can substitute some description for a proper name. Wittgenstein is not satisfied with this, because it is not established how much of the description must be false to assume that such a man did not exist, nor a fixed and definite meaning can be assigned to a word. However, he has no answer as to what these sentences then mean. We can find the answer, however, by returning to the thesis of the purposeful ordering of utterances.

For there is always some intention behind such a statement: especially in the situation described above, where saying "X existed" we cannot verify this directly in a trivial way, but only based on other hypothesis. This very hypothesis answers *for what purpose* do we say that X did not exist? What do we want to communicate

—that is the key question. Let's consider an example:

Example 2.4 *In the 19th century, astronomers search for hypothetical planet Vulcan, allegedly located very close to the sun. They were observing moving dark spots on the sun or photographs of solar eclipses (in which the planet was seen). Vulcan was supposed to explain the orbital anomalies of Mercury, according to the idea of Urbain Le Verrier, who similarly explained the orbital anomalies of Uranus by discovering the existence of Neptune.*

So if we read "Vulcan exists" in 1910 in a newspaper, it would mean: observations could be ordered in such a way that they actually describe the orbit of a planet, which also explains the precession of Mercury, in accordance with the purpose for which the hypothesis of the existence of Vulcan was postulated. However, nothing like this was achieved: so astronomers concluded "Vulcan does not exist," recognizing that the hypothesis was false (which was further justified later, when the precession of Mercury was explained by the General Theory of Relativity).

So what is the sentence "Vulcan does not exist"? A simplified explanation of the physicists' thinking, probably. Although it is not precise, it fulfills the task of telling part of the story to the wider public. A similar example can be given in history. For example, it is believed that Russian stories about Ilya Muromets cannot refer to one person. If Ilya served Vladimir I, it means that he could not fight against Batu Khan. Vladimir reigned in the 10th and 11th centuries, Batu Khan in the 13th. So "Ilya Muromets did not exist" in the sense that there was not one man whom these stories extol, but at the same time he may have existed in another sense (e.g., one Ilya served Vladimir, and someone else with that name against the army of Batu Khan).

2.4.8 What Does It Mean to "Understand"?

In (PI 143) and for the following paragraphs, the author explores a story in which a teacher (person A) shows a student (person B) a sequence of numbers, expecting the student to guess the rule for generating the next terms and give a few or more of them. For example, let it be the Fibonacci sequence in which the next term is the sum of the two previous ones. So the teacher gives 1, 1, 2, 3, 5, 8, 13,... the student then says 21, 34, 55, 89; which is correct answer. Can we say that the student understands? Can the teacher be certain of it?

The answer to the first question is simple: the student must guess the correct rule ordering the next terms with respect to the previous terms, the final cause. Has the student guessed the same final cause as the teacher, then he would solve the puzzle. Note however, that such a solution is not logically unique in the described situation. But it matters not, as the whole situation is a phenomenon of game theory, based on yet another final cause invented by the teacher (how the student should reason to guess the correct order). For example, the teacher gives the first 6 terms of the Fibonacci sequence, making that the hypothesis that the next term is the sum of the two previous ones is the only such simple hypothesis that fits the data. If we wanted to fit a polynomial interpolation, or another model, to these numbers, it would have to be much more complicated. Solution must be planned with the puzzle itself; correct solution is a solution that fits and that is appropriately optimal. Without this plan, correctness would lose its meaning. Clearly, without talking of final causes directly, Wittgenstein cannot grasp it.

2.5 From Wittgenstein to Kuhn

Wittgenstein in his *Philosophical Investigations* provides examples where the meaning of an utterance is its final cause. This poses a problem for positivists, but not for traditional philosophy. This has additional implications when we consider the connection with the main revelation of 20th-century philosophy of science: namely, that science (and physics above all) is a construct of crowd psychology, and that "truth" and similar concepts exist only conventionally within such a construct. This is widely recognized opinion of Thomas Kuhn[44]. Kuhn, citing Ludwig Wittgenstein, invokes his theory of language meaning based on everyday language[45].

> In the absence of a competent body of rules, what restricts the scientist to a particular normal-scientific

[44]Horgan, "What Thomas Kuhn Really Thought about Scientific "Truth""

[45]Kuhn, *Structure of Scientific Revolutions: 50th Anniversary Edition*, s. 44

> tradition? What can the phrase 'direct inspection of paradigms' mean? Partial answers to questions like these were developed by the late Ludwig Wittgenstein, though in a very different context. Because that context is both more elementary and more familiar, it will help to consider his form of the argument first. What need we know, Wittgenstein asked, in order that we apply terms like 'chair,' or 'leaf,' or 'game' unequivocally and without provoking argument?2

Kuhn's entry point into analyzing the language of physicists is the view of the Philosophical Investigations, which suggests that only everyday language has meaning. Kuhn strangely generalizes this to theoretical disciplines, believing that they develop similarly to everyday language. Another quote from Kuhn:[46]:

> Except when all the conceptual and manipulative categories are prepared in advance—e.g., for the discovery of an additional transuranic element or for catching sight of a new house—both scientists and laymen sort out whole areas together from the flux of experience. The child who transfers the word 'mama' from all humans to all females and then to his mother is not just learning what 'mama' means or who his mother is. Simultaneously he is learning some of the differences between males and females as well as something about the ways in which all but one female will behave toward him. His reactions, expectations, and beliefs—indeed, much of his perceived world—change accordingly. By the same token, the Copernicans who denied its traditional title 'planet' to the sun were not only learning what 'planet' meant or what the sun was.

Planets seen with the naked eye are small, bright points visible at night, while the Sun is a bright disc of great luminosity. This is easy to notice and describe. Therefore, not only theory, but almost every primitive prehistoric myth will distinguish the Sun and planets, or moving stars. Continuing Kuhn's quote:

[46] ibid., s. 128

> Instead, they were changing the meaning of 'planet' so that it could continue to make useful distinctions in a world where all celestial bodies, not just the sun, were seen differently from the way they had been seen before.

For Kuhn, the fact that physical theory changes means that the world itself changes, which one commentator Lipton called "Kant on wheels"[47]. What common sense describes as objective reality, Kuhn considers a psychological effect—and a change in the prevailing theory changes this "reality". An advocate of this type of philosophy, Wojciech Sady, also points to other linguistic inspirations for Kuhn, which, however, are very similar to the key error of the later Wittgenstein[48]:

> Kuhn, in The Structure of Scientific Revolutions, refers to the Philosophical Investigations in connection with the concept of "family resemblances." From there also might originate Kuhn's most famous concept: "paradigm." ...At least indirectly, Kuhn was familiar with Wittgenstein's arguments about the influence of language on the way the world is perceived. However, this was probably not the decisive influence on him, and Benjamin Lee Whorf's reflections on the influence of linguistic forms on perception and thought had a much stronger effect: "When linguists critically and scientifically examined many languages with entirely different patterns, (...) phenomena previously considered universal appeared in a new light (...). It turned out that the system of linguistic background (in other words – grammar) is not simply some reproductive tool for expressing ideas, but a factor shaping these ideas, a program and guide for mental activity, the analysis of experiences, and the intellectual synthesis of each of us. The process of formulating thoughts is not independent and rational in the traditional sense

[47] Lipton, "Kant on Wheels"

[48] Sady, "Thomas S. Kuhn o nauce normalnej i rewolucjach naukowych [Thomas Kuhn on normal sciences and scientific revolutions]"

> but is a fragment of a specific grammar and exhibits more or less variation depending on it."

Thus, when linguists examined *critically and scientifically* many languages, they discovered that the process of formulating thoughts is not *rational* in the *traditional sense* but is instead a fragment of a specific grammar. Why is there a disjunctive alternative here, not one but the other? What does grammar even have to do with rationality to be its opposite? This is precisely their main claim: that this "ordinary language" of the scientific community, or a social construct, takes precedence to facts, experiences, theories, and scientific truth in general.

However, when we consider the correct theory of language, which has in large part existed for a very long time, we see that none of this is true. Aristotle undoubtedly used a different language, but Aristotle can be explained and understood in our language as well, and we can also trace the *purpose* of his statements, arriving at the sense of the theory. Sense is largely constituted by the final cause—how phenomena are globally ordered for sake of future effects that the scientists intends to predict. This is what remains comprehensible in ancient science and constitutes a valuable treasury of knowledge, which continues to grow to this day without being refuted. Just as Ptolemy's equant anticipates Kepler's model, and Kepler's model is a special case of Newton's laws. In the meantime, crystalline spheres were replaced by vortices, and vortices by action-at-a-distance, and in this way the theory benefited from contributions by people with vastly different views of the world. With difference being utterly irrelevant for the "hard core"[49] of the theory, the description of relations among quantities. We will elaborate on that separately from p. 123.

[49] as Weinberg put it (Zawistowski, *Order and Contingency*), p. 120

3 Statistical Tests and the Replication Crisis

We said that the task of science is to discover, how causes are organized and coordinated for sake future effects and, subsequently, how to predict unknown effects based on known causes. To model, understand, and predict phenomena, some sciences rely on the use of statistics. Physics, astronomy, and chemistry rely on precise predictions of experiments to iterate the research process and improve theories and models. If such a procedure is not possible, one can examine whether a proposed improvement enhances our current model in the light of probability distributions. This decision process is often the subject of statistical testing, and Bayesian analysis also serves a similar purpose.

The influence of positivists and scientism advocates on this area of the scientific method stems from their denial of the role and meaning of final causes. In more explicit terms: in a complex world, where the future rarely resembles the past, probabilities can only be determined by adopting specific theories and models. Similarly, the probability of a hypothesis can only be determined relative to already established theories that describe previously known relationships. Hence the terms: null hypothesis, representing current knowledge, and alternative hypothesis, representing a proposed improvement of it. The model-building process is important.

On the other hand, scientism adherents determine the probabilities of individual events and individual facts as if they were akin to coin tosses or other games of chance, without connecting them to a tested model describing relationships between measured quantities of cause and effect. Furthermore, having calculated a frequency, mean and correlation, they often assume that the same quantity is equally representative of the future[50].

The result is the deterioration of the scientific method, leading to the replication crisis, where as much as half of published research findings are untrue, along with various other issues in life

[50] According to the so-called principle of induction, which positivists unsuccessfully attempted to justify (see pp. 113 and 116), claiming that all of science is based on it.

sciences, the legal system, finance and elsewhere. Some individuals particularly responsible for this were simultaneously co-creators of the neo-Darwinian synthesis (an outdated theory combining Darwin's theory with Mendelian genetics) and proponents of eugenics, supporting racism and discrimination in the name of "evolutionary benefits."

3.1 Statistical Test According to Gosset, Neyman, and Pearson

The common understanding of statistical tests can be summarized as follows: if I observe a degree of an anomaly that happens no more often than once in 20 trials (according to a statistical significance value of 5%), it is likely not a coincidence. For instance, in a medical study, if one group of 100 subjects is given a drug and another group receives a placebo, and 54 people are cured in one group and 51 in the other, this would probably be a purely random difference. However, if 90 people were cured after taking the drug, this would certainly represent a real effect.

Such reasoning is only valid under certain conditions. For example, we do not say that it is "statistically significant" when a man I meet is taller, shorter, paler, or more tanned than the previous 20 men I encountered. There are many traits to choose from, and generally, for every person, one can find some characteristic that distinguishes them from 20 others. Similarly, every license plate is improbable because it is unique among millions, but almost meaningless in itself: only the ability to identify a vehicle gives this information its significance. The purpose of a test is more often the incremental building and improvement of a model. A single test concerns a decision: we decide between our current state of knowledge (e.g., "the drug does not help, within the existing protocol") and its improvement ("the drug helps treat the disease"). The former is called the null hypothesis, and the latter the alternative hypothesis.

When designing an experiment, we must ensure in advance that the test genuinely corresponds to such a decision. In itself, a statistical test simply points to an anomaly in the null hypothesis, answering whether such a large anomaly happens once in 20 trials or less frequently. This means that repeating the test 10–20 times will generally produce a false positive result. If a street magician promises to guess which card in the deck is the ace of hearts, this will only be surprising if he does it flawlessly in every attempt, not if he succeeds once in 10 tries. Therefore, an additional criterion is required. The theory was developed by Neyman and E. Pearson[51], influenced by William Gosset, and based on the observation that behind an experiment, there should be a theory and a model to understand and predict cause-and-effect relationships.

It is not enough for a positive test result to have statistical significance (to be improbable under the null hypothesis); it is also important that it be expected under the alternative hypothesis—so much so that the relative probability of such a result is much higher when the alternative hypothesis is true. If I conduct an experiment and discover a strong factor that I postulated as the cause, and which explains the entire magnitude of the effect, then I can indeed expect this condition to be met. The alternative hypothesis in a way predicts the result and is likely correct.

However, if I do not specify in advance the expected range of the result, if I perform many tests, or if I am satisfied with weak effects, I encounter a number of problems. First, in a long series of different experiments, false positives will always occur: a statistical test with a 5% significance threshold produces them once in 20 cases.

Second, if I do not know the expected range of effect size in advance, I have not even objectively established what I consider to be an effect or the absence of one. Statistical significance from the test alone is a poor criterion for such a decision because, with a sufficiently large sample size, any weak deviation from expectations will be deemed "improbable".

Such deviations, however, almost always exist. Neither are our statistical models a perfect reflection of reality (as we will especially see in finance), so small discrepancies are common. Nor should it be expected of most disturbances to be uncorrelated with anything in highly complex systems, since many mechanisms are interdependent in a complicated way (e.g., aspirin disrupts many physiological mechanisms, so its influence on many diseases is nonzero, which

[51] Neyman and Pearson, "On the problem of the most efficient tests of statistical hypotheses"

does not mean that it is of interest or of importance). In such a case, the statistical test alone will not help. From a mathematical point of view, given the measurement results D, we need to ensure that the probability of the alternative hypothesis is high $p(H_1|D)$, but the statistical test only provides us with "relative likelihood" $p(D|H_1)/p(D|H_0)$. This value, however, tells us little about $p(H_1|D)$ if:

- The null hypothesis is poorly formulated and likely not true, which means that $p(D|H_0)$ is small.
- There are other, more relevant hypotheses $H_2, H_3, H_4...$, such that $p(D|H_1) < p(D|H_2)$, $p(D|H_1) < p(D|H_3)$, and so on.

In summary, for a statistical test to be useful, the alternative hypothesis should anticipate the observed effect size and should ideally be the only plausible hypothesis; both turns out easy if we postulate a strong and dominant effect while ignoring weak and secondary ones. Secondly, the null hypothesis should be the best possible representation of prior knowledge.

3.2 The Replication Crisis

The replication crisis refers to a phenomenon, observed 20 years ago, where certain published research findings cannot be reproduced when experiments are independently repeated; this suggests that these results are false. It particularly affects fields dealing with complex phenomena: clinical studies, psychology, sociology, neuroinformatics, and certain branches of machine learning.

A study in the field of psychology[52] attempted to replicate 100 psychological studies from prestigious journals, successfully replicating only 36.

Camerer et al.[53] were able to reproduce 62% of tested experiments from social science studies published in Nature and Science.

In an analysis of clinical studies[54], only 11% of research on drug

[52] Collaboration, "Estimating the reproducibility of psychological science"

[53] Camerer et al., "Evaluating the replicability of social science experiments in Nature and Science between 2010 and 2015"

[54] Prinz, Schlange, and Asadullah, "Believe it or not: how much can we rely on published data on potential drug targets?"

targets could be reproduced, while another article[55] claimed that low replication rates in preclinical studies hinder the development of new treatments. Another study[56] found that machine learning systems dealing with content recommendations, as reported in recent publications, often overstate their results, and their performance is rarely significantly better than traditional algorithms.

John Ioannidis[57] from Stanford University wrote a 2005 article titled Why Most Published Research Findings Are False, offering a theoretical explanation of this phenomenon. He points, among other things, to the problem of "drawing research conclusions based solely on p-values," i.e., statistical significance:

> Several methodologists have pointed out [9–11] that the high rate of nonreplication (lack of confirmation) of research discoveries is a consequence of the convenient, yet ill-founded strategy of claiming conclusive research findings solely on the basis of a single study assessed by formal statistical significance, typically for a p-value less than 0.05. Research is not most appropriately represented and summarized by p-values, but, unfortunately, there is a widespread notion that medical research articles should be interpreted based only on p-values.

This is a flawed view: statistical significance on its own might mean very little. Nevertheless, this belief is oddly widespread. If, for example, 100 experiments are conducted, and none truly investigates an actual relationship, one would still obtain about 5 positive results, all of which would be false. Ioannidis provides an example of this: there may be about 10 genes influencing schizophrenia out of 100,000 possible candidates, meaning only 1 in 10,000 experiments could yield a positive result. If the research includes additional arbitrary parameters and subjectivity, the ratio worsens further. Thus, as he concludes (ibid.):

[55] Begley and Ellis, "Drug development: Raise standards for preclinical cancer research"

[56] Dacrema, Cremonesi, and Jannach, "Are we really making much progress? A worrying analysis of recent neural recommendation approaches"

[57] (Ioannidis, "Why Most Published Research Findings Are False")

- *"Corollary 2: The smaller the effect sizes in a scientific field, the less likely the research findings are to be true. Power is also related to the effect size. Thus research findings are more likely true in scientific fields with large effects... "*

- *"Corollary 3: The greater the number and the lesser the selection of tested relationships in a scientific field, the less likely the research findings are to be true."*

- *"Corollary 4: The greater the flexibility in designs, definitions, outcomes, and analytical modes in a scientific field, the less likely the research findings are to be true. Flexibility increases the potential for transforming what would be "negative" results into "positive" results, i.e., bias, u."*

One might think that only single experiments are affected and that results confirmed through several independent studies are often true. However, the author (ibid.) thinks otherwise:

> As shown, the majority of modern biomedical research is operating in areas with very low pre- and post-study probability for true findings. Let us suppose that in a research field there are no true findings at all to be discovered. History of science teaches us that scientific endeavor has often in the past wasted effort in fields with absolutely no yield of true scientific information, at least based on our current understanding. In such a "null field," one would ideally expect all observed effect sizes to vary by chance around the null in the absence of bias. The extent that observed findings deviate from what is expected by chance alone would be simply a pure measure of the prevailing bias.

Even in a world where studies were perfectly objective, a sufficiently large number of trials would still produce a few recurring false positives. Moreover, if a known result fails to replicate, the experimenter might suspect any issues, conducting auxiliary experiments. In practice, this is compounded by the pressure to publish positive results and avoid contradicting already published findings.

In physics, where replicating an experiment is usually straightforward, the case of Millikan's oil-drop experiment[58] is well known: the initial experiment produced an incorrect result, and several subsequent studies produced results that "drifted" slowly toward the actual value (implying a reluctance to openly challenge Millikan's initial result).

In research on complex systems, false positives are much easier to obtain, so significant biases caused by strong beliefs or commercial interests can much more easily produce convenient, false results. Only after a very long time is such established "orthodoxy" questioned, as seen, for example, in the current reevaluation of dietary advice from the past 40 years.

3.3 Power of the Test and R in Examples

These relationships can be clarified with use of Neyman-Pearson test power and the R value, introduced by Ioannidis, which denotes the odds of testing true hypothesis to testing false one (as well as the analogous concepts of prior and posterior probabilities in Bayesian statistics).

The power of a test is the probability of a positive outcome given that the tested hypothesis is true, expressed as $1 - \beta$, where β is the probability of a false negative (type II error, where the result suggests rejecting the alternative hypothesis when it is true). The smaller the power, the more true relationships we overlook; in practice, power values much below 80% can break our research process.

R, on the other hand, is the odds of true to false hypotheses within a particular field of science or research program. Its Bayesian counterpart, $p(H_1)$, is the a priori belief in the truth of H_1 (before obtaining the experimental result). I consider these concepts nearly equivalent for practical use.

Sometimes, as Ioannidis indicates[59], we know that R is small: for example, it is estimated that out of 100,000 possible genes, only 10 may have some association with schizophrenia. Thus, test-

[58](Niaz, "The Oil Drop Experiment: A Rational Reconstruction of the Millikan-Ehrenhaft Controversy and Its Implications for Chemistry Textbooks")

[59]Ioannidis, "Why Most Published Research Findings Are False"

ing individual genes is futile[60]. Conversely, if we test an established physical theory, $R > 1$ and $p(H_1) > 0.5$ are likely, as such experiments rarely fail. For instance, a certain physicist[61] offered to eat his shorts on television if the result of the OPERA experiment suggesting the existence of superluminal neutrinos[62] were confirmed. Systems and phenomena appearing to violate the laws of physics more often turn out to result from a misinterpretation of the experiment. For example, the EM Drive was a prototype space propulsion system that seemed to violate the principle of momentum conservation by generating thrust without interaction with matter. It used microwaves contained in a vacuum cavity[63] and NASA studies confirmed that it worked[64]. Later studies clarified the effect[65][66] as following from Ampere's law, with the forces acting on cables in Earth's magnetic field.

Similarly, the phenomenon of cold fusion[67], initially supported by the reports from few laboratories, remains unconfirmed. Subsequent studies failed to replicate the results[68][69]. The lead author, Fleischmann, was a highly accomplished scientist in 1989 (with 272 publications and a Fellowship of the Royal Society), making it unlikely he would report something he hadn't observed or rigorously tested. Another notable erroneous result came from[70] the anomalous state of water, purportedly exhibiting different boiling and freezing points, as well as altered viscosity. These phenomena

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[60] There are automated techniques based on Bayesian statistics, such as Automatic Relevance Determination, which can sometimes address such problems.

[61] (Al-Khalili, *The Life Scientific*)

[62] (Collaboration, "Measurement of the neutrino velocity with the OPERA detector in the CNGS beam")

[63] (Shawyer, "A microwave propulsion system")

[64] (White et al., "Measurement of impulsive thrust from a closed radio-frequency cavity in vacuum")

[65] (Tajmar and Fiedler, "The spacedrive project-thrust measurements of an EmDrive and potential spurious effects")

[66] (Tajmar and Kößling, "EmDrive investigation with a rotating thrust balance")

[67] Fleischmann and Pons, "Electrochemically induced nuclear fusion of deuterium"

[68] (Lewis et al., "Searches for low-temperature nuclear fusion of deuterium in palladium")

[69] (Morrey et al., "Measurements of helium in electrolyzed palladium")

[70] (Deryagin and Churaev, "Nature of "anomalous water"")

were later found to result from impurities in the samples.

All of these examples attack the boundaries of experimental physics. They involve weak and not fully understood effects alongside highly complex measurement systems. Under such circumstances, it is easy to obtain false positives or incorrect explanations of real effects. Weak effects and complex measurements impact test power: if we must disentangle numerous weak, unknown phenomena, we cannot reliably determine whether known physical laws can explain it. In terms of statistics this corresponds to the probability distribution of the null hypothesis being uncertain, and the distribution of the alternative hypothesis being very close to the null. It is, therefore, nearly impossible to distinguish the two reliably.

Physics also provides numerous cases where test power is very high. The first type includes precise predictions for quantities previously unknown. The second type occurs when the null hypothesis (based on known physical laws) predicts something entirely different than the alternative hypothesis (which requires modifications of those laws). In such cases, power is high. This observation—that it is worth to focus on strong effects—applies even more outside physics and chemistry, as also noted by Ioannidis[71] as well as Ziliak and McCloskey[72]. Strong effects and their primary causes are associated with high test power, while weak effects and secondary causes correspond to low power. Moreover, using the old scholastic principle that every effect has a proportional cause, we can also ensure a relatively large R. For example, if we test a new drug and observe quick, unexpected improvement in most patients, or if we test a new rust remover and see rust being removed quickly and effectively, or if we test a new variety of beets and find it produces much larger beets than before.

This is very important because, when R is very small, any true relationships coexists with large number of false positives, and independent replication is not enough to assure validity. Evidence for this lies in the existence of null fields, where entire fields of research, based on numerous statistically significant results, are discredited over time, typically when a better theory emerges. As Ioannidis points out, this seems to result from biases within the

[71] Ioannidis, "Why Most Published Research Findings Are False"

[72] Ziliak and McCloskey, *The Cult of Statistical Significance: How the Standard Error Costs Us Jobs, Justice, and Lives*

scientific community. Scientists, tasked with finding evidence for, say, the impact of egg consumption on heart disease, will always find something if they try long enough, regardless of whether the hypothesis is actually true.

This is similar to Kuhn's radical conclusion that a theory is accepted along with a change in the criteria for its truth, making it not an objective phenomenon but a result of crowd psychology. Kuhn wrote about physics, where this conclusion is generally untrue, as theories are almost never entirely overturned. However, Kuhn's theory is more applicable outside of physics. We will see this in the case of biostatistics and the eugenicist Fisher. Not only were the standards of the empirical method replaced with ones convenient for the new theory and the eugenic ideology of an ambitious social engineer, but this new methodology, thanks to Fisher's popular textbooks, spread its flaws to other fields.

Due to these difficulties, sciences dealing with complex systems find it hard to avoid false positives, as evidenced by the previously mentioned low replication rates. Some of these false positives take root for decades. An example is the idea, dating back to the 1950s, that saturated (meat and dairy) fat consumption causes heart disease, based primarily on the "Seven Countries" study[73], which shaped the widespread promotion of low-fat diets. However, such influence was never confirmed in clinical trials[74], and there is now even evidence pointing to the opposite relationship: a reduced risk of heart disease with a diet rich in saturated fats[75].

3.4 The Cult of Statistical Significance

One of the most important contributions to the discussion on statistical significance and the crisis in science was made by Chicago economists Ziliak and McCloskey in their book The Cult of Sta-

[73](Keys, "Seven Countries: A multivariate analysis of death and coronary heart disease")

[74](Teicholz, "A short history of saturated fat: the making and unmaking of a scientific consensus")

[75](Dehghan et al., "Associations of fats and carbohydrate intake with cardiovascular disease and mortality in 18 countries from five continents (PURE): a prospective cohort study")

tistical Significance[76].

Thomas Schelling, the mathematician and Nobel Memorial Prize laureate, noted that he could not understand the resistance to the "very elementary, very correct, and very important" argument that Ziliak and McCloskey had developed in a series of publications. The key to avoiding problems lies in a few methodological principles that were initially discovered by William S. Gosset, known by the the pseudonym "Student."

- The most important aspect of the discovery is the magnitude and real-world significance of the effect.
- Statistical significance is not the same as real significance; it merely helps determine whether the effect is not random error.
- Hypothesis testing is a decision-making process, and real-world significance depends on the economic calculation.
- The probability of a hypothesis in a test is relevant only with respect to the probability of another hypothesis (the alternative hypothesis to the null hypothesis).

This method is analogous to that of Neyman and E. Pearson; indeed, Gosset had influenced their development of it. In addition to the test itself, the proper construction of the hypothesis as a decision problem is essential. The hypothesis should take into account the most important causes that contribute the greatest effect; therefore, the magnitude of the cause and its actual significance must be examined. It is necessary not only to properly formulate the hypothesis but also the decision between the null and alternative hypotheses so that one or the other is necessarily true.

The magnitude of the factors is also crucial—they should be strong and proportional to the effect they are meant to explain. This is important not only to ensure practical usefulness (which is separately important) but also to seriously expect that we have identified the correct cause. After all, we are searching for an ordering of causes for sake of future effects.

[76] Ziliak and McCloskey, *The Cult of Statistical Significance: How the Standard Error Costs Us Jobs, Justice, and Lives*

Example 3.1 *An anti-inflammatory drug, such as aspirin or ibuprofen, works by blocking the COX enzyme, which in turn weakens the production of the PG enzyme, thereby halting various complex processes dependent on it, alongside the drug's metabolism and secondary interactions. This is the dominant, though not only, effect, and understanding it is crucial to reason about the safety and efficiency of the drug, including for patients who are sick or taking other medications. Moreover, there will often* be *additional weak effects when, in the complex machinery of the body, a substance can disrupt various processes in many ways. Therefore, identifying causes with the proper magnitude becomes especially important.*

Critics of the mentioned book often distort the argument by claiming that the issue of effect size pertains only to practical applications and not to the fundamental scientific understanding of phenomena. Again, this reveals a connection with the rejection of final causes. Reviewer O. Häggström[77] writes on this matter as follows:

> Imagine now that a new drug for reducing blood pressure is being tested and that the fact of the matter is that the drug does have a positive effect (as compared with a placebo) but that the effect is so small that it is of no practical relevance to the patient's health or well-being. If the study involves sufficiently many patients, the effect will nevertheless with high probability be detected, and the study will yield statistical significance. The lesson to learn from this is that in a medical study, statistical significance is not enough—the detected effect also needs to be large enough to be medically significant.

But not only that—for Neyman, E. Pearson, and J. Ioannidis, **strong effects are important because they are more likely to be true.** Assume that for a new antihypertensive drug we have a working hypothesis explaining why it should be effective (based, for example, on in vitro studies). If the drug shows a positive effect

[77](Häggström, "Book review: The Cult of Statistical Significance")

but not one of the magnitude suggested by the hypothesis, then the hypothesis is incorrect, at least partially. Its practical uselessness would be separate issue, and not only a matter of magnitude, but also unpredictability.

It is also common sense that heart attacks in a population can only be explained by factors strong and widespread enough to account for nearly the entire observed effect. This is why we identify causes such as smoking, alcohol consumption, sugar intake, or obesity (frequent and strong causes), but not, for instance, hypothermia, lightning strikes, or chest injuries (weak or rare causes). The salty taste of a dish can be explained by salt if a tablespoon of it was added, not just a grain. One can become drunk from a glass of vodka, but not a single drop. To explain an effect, the cause must be sufficiently strong and remain in proper numerical proportion to the observed effect: this is primarily a matter of evidence, not of practical utility; and practical utility deteriorates strongly if someone does not know what is he doing, as it evident from various errors and failures. Ziliak and McCloskey cite the infamous case of the drug Vioxx by Merck[78].

Example 3.2 *The pharmaceutical company ignored (and partially falsified) reports that their new drug caused heart disease, labeling these results as "statistically insignificant." As a result, tens of thousands of people died after taking the drug, and the company had to pay billions in damages. The research on Vioxx highlights problems with relying on statistical significance. In one Vioxx study, 8 people suffered heart attacks*[79]*. However, 3 of these cases were excluded by dishonestly counting heart attacks over a shorter period than gastrointestinal incidents that put Vioxx in a favorable light. This allowed the influence of Vioxx on heart disease to be deemed "statistically insignificant." Another issue was the misuse of statistical significance: even if there were only 5 heart attacks instead of 8, the arbitrarily chosen 5% significance threshold is not a sufficient reason to ignore such findings when the* real significance *of life-threatening complications is undeniably high. Furthermore, the lack of a requirement to provide measurable sizes of effects in*

[78] Ziliak and McCloskey, *The Cult of Statistical Significance: How the Standard Error Costs Us Jobs, Justice, and Lives*, p. 28

[79] Krumholz et al., "What have we learnt from Vioxx?"

favour of explanations let to utterly unsubstantiated speculation. Researchers argued that the heart attacks in the Vioxx group occurred spontaneously and that naproxen (standard drug used in the control group) had a protective effect, which quelled further interest in the Vioxx heart attacks.

The second principle is this: the probability of a hypothesis in a test is relevant only in relation to the probability of another hypothesis. Test can establish the improbability of the currently accepted model of phenomena (the null hypothesis), which is then rejected. We then adopt the alternative hypothesis as consistent with the data, which requires the additional assumption that it is the only correct alternative hypothesis.

Both steps are susceptible to error: We err when testing the null hypothesis that does not adequately represent current knowledge; for instance: if instead embodies a simplistic model that is easy to refute. We err when adopting an alternative hypothesis that is neither the sole nor the correct explanation. In both cases, both the null and alternative hypotheses are likely false, meaning the test provides no basis for rejecting one in favor of the other.

How can this be avoided? Gosset spent most of his life working in brewing, employed by Guinness to systematically study and optimize the production process. His studies focused on a multi-step, repeatable industrial process that turned barley, water, and hops into dark beer. One question[80] concerned the effect of soft and hard resins in hops on the quality of the beer. For example, should fresh, resinous hops be used in smaller proportions than stale hops from the previous year? This presents a decision problem: we need to answer "yes" or "no." One answer becomes the alternative hypothesis, and the other the null hypothesis. The null hypothesis implicitly contains all previously established knowledge, and it is used to design the experiment.

We must produce two identical samples of beer that differ only in the amount of the resinous component; everything else must remain exactly the same. This principle is often used in clinical trials, where patients are randomly divided into two groups (to avoid significant differences), with one group receiving the drug and the other an identical-looking placebo. Thus, we compare two

[80] Box, "Guinness, Gosset, Fisher, and Small Samples"

strictly analogous experiments that differ only in the tested factor's influence: if there is a significant difference between them, it supports the alternative hypothesis.

Ziliak and McCloskey argue that these principles are no longer respected in 8 or 9 out of 10 scientific publications today[81]. The analysis of effect size and real significance is ignored in favor of statistical significance alone, which equals to: lack of experimental setups involving two mutually exclusive hypotheses. This especially applies to establishing absolute facts based on a single test. Under such conditions, it is easy to design a test where both the null and alternative hypotheses are false; simply because relevant factors were neglected. We then observe an effect but misinterpret it based on our speculations, which often turn out to be wishful thinking.

A famous U.S. court case from the 1960s (People v. Collins) resulted in a conviction because the suspect shared seemingly improbable traits with the assailant (being Black, having a mustache, driving a yellow car, and having a white partner). By multiplying the low frequencies of these traits, the court concluded that such a combination was extremely unlikely, justifying the conviction. This conclusion, however, was based solely on the flawed null hypothesis, which assumed independent distributions and multiplied probabilities that were likely not independent. If an earring and a mohawk hairstyle each occur in 1 out of 100 people, this does not mean the two together occur in 1 out of 10,000. They often coexist in the same individuals—for example, if someone has a mohawk, they are also likely to wear an earring.

Another scandalous legal case was that of Sally Clark in England, a mother of two infants who died of sudden infant death syndrome (SIDS), as well as of similar convictions based on the testimony of expert R. Meadow. According to the calculations used, the chance of SIDS occurring was 1 in 8,500. Squaring this figure gives 1 in 73 million, which was erroneously presented as the probability of two infants dying of SIDS in the same family and, in result, an evidence to accuse the mother. This estimation was a gross misuse of statistics.

First, there is no evidence to suggest that two SIDS cases in the same family are independent events. Genetic defects and other fac-

[81] Ziliak and McCloskey, "The Cult of Statistical Significance"

tors might cause repeated occurrence. R. Hill, reviewing the case before the second appeal, demonstrated that the likelihood of a second SIDS case is 5–10 times higher following the first. Moreover, this figure was misinterpreted as the "probability of Sally Clark's innocence," whereas both SIDS and infanticide are extremely rare events. Hill calculated that double SIDS was more likely than double infanticide[82].

3.5 Balanced and Randomized Experiments

We have outlined the criteria necessary for a statistical experiment to be valid; now we will describe a simple and well-known method by Gosset to easily meet these criteria. Namely, one should conduct many diverse pairs of nearly identical experiments that differ only in the factor under consideration. If we, for example, study crops two varieties of barley, we need a pairwise study of nearly identical samples, planted next to each other.

Gosset developed this method in the context of studying agricultural crops, which he required for optimizing beer production and the raw material supply chain. He quickly discovered that studying barley varieties was challenging: the results depended on a large number of variables (such as weather, humidity, soil, fertilizer, pests, diseases, weeds, etc.). Furthermore, it was often impractical to rely on data from just one growing season, as waiting 5 or 10 years was too expensive. Gosset devised a brilliantly simple solution[83]:

> If we consider the causes of variability in crop yields, it seems we can generally divide them into two kinds. The first are random, occurring arbitrarily across the field—for example, bird attacks, the presence of weeds, or fertilizer clumps. The second are more regular, increasing locally or spreading from particular centers—examples include changes in soil quality, wet spots near springs, or rabbit burrows along hedges.

[82] Hill, "Multiple sudden infant deaths – coincidence or beyond coincidence?"

[83] Ziliak, "Balanced versus Randomized Field Experiments in Economics: Why W. S. Gosset aka "Student" Matters", p. 178

> In each case, consideration of the examples above shows that any 'regular' cause of variability will tend to influence the yield of neighboring plots in a similar way; for instance, if the yield of one plot is reduced by rabbits from a nearby burrow, the neighboring plot is likely to be similarly affected, whereas a more distant plot may remain untouched, and so on. The smaller the plots, the more 'regular' the causes of variability appear; for example, in the case of large plots, a thistle patch may easily occur entirely within one plot, leaving adjacent plots nearly unaffected or completely untouched, but with very small plots, the plot containing thistles is almost certain to have neighboring plots also affected by thistles.
>
> Now, if we compare two varieties, it is clearly advantageous to arrange the plots such that the yields of both varieties are influenced by the same causes to as similar a degree as possible. To achieve this, it is necessary, according to the above considerations, to compare plots lying next to each other and to make these plots as small as practicable and convenient.

Therefore, Gosset, selected small sections of a field, dividing each section into two plots and always planting two different varieties of barley. Then, by having, for example, 20 such sections, we can very accurately determine which variety is better by calculating the average difference in yields between corresponding plots[84]:

> The benefit of this method comes from comparing each plot with its neighbor and calculating the standard deviation of the differences between these pairs of neighboring plots. From what was said above regarding the presence of 'regular' sources of error, it follows that such differences will depend much more on the variety and much less on errors compared to simply comparing aggregate yields.

[84] Ziliak, "Balanced versus Randomized Field Experiments in Economics: Why W. S. Gosset aka "Student" Matters", p. 179

The yield might be higher or lower in a given part of the field due to variations in soil composition, proximity to a rabbit burrow, or nearness to a groundwater valley. However, none of this should significantly impact the experiment when we compare only neighboring plots, thereby eliminating the influence of various secondary factors and isolating the differences attributable primarily to the cultivated variety. This ensures that we are testing the correct alternative hypothesis.

Of course, this is not the only advantage[85]. Gosset deliberately aimed for 20 independent trials under different conditions, ensuring that these trials were comparable. A barley variety is commercially better not just when it yields *on average* more, but when it provides stable returns regardless of other variables.

Through this approach, the null hypothesis becomes the best possible representation of current knowledge, while the alternative hypothesis becomes the only plausible one when the null is rejected—precisely the objective of a good statistical experiment. Furthermore, by considering not just one result but 20, we gain not only a yes/no answer but a wealth of additional data that can be used to build a model of the phenomenon.

For example, what happens if the new variety produces higher yields overall, but some trials suggest susceptibility to drought and weeds? In a letter to Egon Pearson, Gosset wrote[86]:

> "You want to be able to say not only "We have significant evidence that if farmers in general do this they will make money by it", but also "we have found it so in 19 cases out of 0 and we are finding out why it doesn't work in the twentieth." To do that you have to be as sure as possible which is the 20th—your real error must be small."

An alternative method for addressing variability caused by a large number of uncontrolled variables is randomization; however, randomization is far less efficient. In this case, instead of comparing nearly identical experimental variants (e.g., neighboring plots planted with different varieties), we randomly decide whether each

[85] ibid., p. 196

[86] Ziliak and McCloskey, "The Cult of Statistical Significance"

selected plot will be planted with one variety or the other. This procedure allows for averages to be calculated if a sufficient number of plots is used, but it is less effective than a balanced experiment. Random selection may result in an unbalanced configuration where, for example, the new variety is more often planted on barren and arid soil, while the old variety is more frequently planted on fertile and well-irrigated soil.

A serious error is to reduce the difference between balancing and randomization to mere variance in results, as the goal is also to construct a model and thus better understand the phenomenon being studied. By designing a balanced experiment, Gosset takes advantage of having 20 parallel experiments finely tuned to test the hypothesis under different environmental conditions. This provides a wealth of additional information, enabling the understanding of mechanisms and the exclusion of undesirable causes.

A simple average yield increase of 10% is of little value if, for example, the new variety performs much worse in drought, high humidity, or poor soil conditions[87]. Before planting 1,000 hectares of a new barley variety, it must be shown that the effect is stable and predictable under a variety of conditions, which, in turn, vary from season to season.

Balanced experiments are therefore superior. A similar idea underpins the stratification method. Imagine a medical study that seeks to determine whether daily coffee consumption correlates with cardiovascular disease. One might, for instance, examine 1,000 coffee drinkers and 1,000 non-drinkers to compare incidence rates of disease. These 2,000 individuals could be randomly selected from a larger database. However, the observed effect will result not just from coffee consumption but also from other potentially more significant factors that correlate with it. For instance, is the group of coffee drinkers older or younger than the non-drinkers due to cultural factors? Do coffee drinkers have a more balanced diet? Are they leading more stressful lifestyles?

Thus, it is reasonable to examine the effect separately across different age groups and populations stratified by occupation, education level, place of residence, and other factors. This is the only

[87]Especially since mutations under selection often lose genetic complexity, making them stronger in specific conditions but less adaptable overall.

approach that allows us to determine whether increased incidence of disease is due to coffee consumption itself.

3.6 The Principle of Profit Maximization and Statistics as a Decision-Making Process

Pearson and Neyman[88], in developing their theory, refer to a fundamental problem previously described by Bertrand, Borel, and other authors.

> Bertrand put into statistical form a variety of hypotheses, as for example the hypothesis that a given group of stars with relatively small angular distances between them as seen from the earth, form a "system" or group in space. His method of attack, which is that in common use, consisted essentially in calculating the probability,P, that a certain character, x,of the observed facts would arise if they were true. If P were very small, this would generally be considered as an indication that the hypothesis,H, was probably false, and vice versa. Bertrand expressed the pessimistic view that no test of this kind could give reliable results.

The problem lies not only in the fact that the test determines probabilities rather than certainties: "the probability P that a certain characteristic x of the observed facts would occur if the hypotheses were true" is not the same as the probability of the hypotheses being true. At most, it provides a clue, and accepting this clue is fraught with systematic error because it depends on a series of auxiliary assumptions, which may be false.

The response given by the authors is as follows: tests constitute a rule of conduct which, when systematically followed, allows the rejection of false and acceptance of true hypotheses with a sufficient level of efficiency[89]:

> But we may look at the purpose of tests from another view-point. Without hoping to know whether

[88] Neyman and Pearson, "On the problem of the most efficient tests of statistical hypotheses", p. 290

[89] ibid., p. 291

> each separate hypothesis is true or false, we may search for rules to govern our behaviour with regard to them, in following which we insure that, in the long run of experience, we shall not be too often wrong. Here, for example, would be such a "rule of behaviour": to decide whether a hypothesis,H should be rejected, of a given type be rejected or not, calculate a specified character x for the observed facts; if $x > x_0$, reject H. If $x \leqslant x_0$, accept H. Such a rule tells us nothing as to whether in a particular case H is true when $x \leqslant x_0$ or false when $x > x_0$. But it may often be proved that if we behave according to such a rule, then in the long run we shall reject $H$when it is truenot more, say, than once in a hundred times, and in addition we may have evidence that we shall reject H sufficiently often when it is false

The probability of a hypothesis being true is not directly accessible but becomes so indirectly when the hypothesis is tested for various phenomena and experiments. Furthermore, as a decision problem, testing is naturally connected to practical decision making. As we will see more clearly with Nassim Taleb's theories, we might note that payoffs of these decisions are not only function of error rates, but rather rely on the use of the model and the consideration for various risks and uncertainities in it. Gosset intuitively grasped a similar theory in the context of his work at the brewery. As early as 1905, he wrote to Karl Pearson[90]:

> When I first reported on the subject [of "The Application of the 'Law of Error' to the Work of the Brewery"], I thought that perhaps there might be some degree of probability which is conventionally treated as sufficient in such work as ours and I advised that some outside authority in mathematics [such as Karl Pearson] should be consulted as to what certainty is required to aim at in large scale work. However it would appear that in such work as ours the degree of certainty to be aimed at must depend on the pecuniary

[90]Ziliak and McCloskey, *The Cult of Statistical Significance: How the Standard Error Costs Us Jobs, Justice, and Lives*, p. 18

> advantage to be gained by following the result of the experiment, compared with the increased cost of the new method, if any, and the cost of each experiment.

A statistical significance threshold of 5% is not appropriate in every situation; sometimes, one should adopt a higher or lower threshold based on actual significance. For instance, deaths caused by drug side effects are significant in the real-world sense. Even rare and unlikely actual fatalities cannot be ignored when planning to market a drug to millions of people.

3.7 Misunderstanding of Statistics According to Fisher and Positivism

Ziliak and McCloskey pointed out that the statistical theory outlined earlier is widely disregarded in scientific publications, many of which base their conclusions solely on statistical significance. This, they emphasize, is a fundamental error.

The authors argue that such an approach originates from Ronald Fisher, a statistician, Darwinist, and author of widely influential textbooks for researchers[91]. Fisher described the interpretation of statistical tests as follows[92]:

> t is convenient to draw the line at about the level at which we can say: "Either there is something in the treatment, or a coincidence has occurred such as does not occur more than once in twenty trials." ...Personally, the writer prefers to set a low standard of significance at the 5 per cent point, and ignore entirely all results which fail to reach this level. A scientific fact should be regarded as experimentally established only if a properly designed experiment rarely fails to give this level of significance

> It is usual and convenient for experimenters to take 5 per cent. as a standard level of significance, in the sense that they are prepared to ignore all results which

[91] ibid., p. 216
[92] Ziliak and McCloskey, "The Cult of Statistical Significance"

> fail to reach this standard, and, by this means, to eliminate from further discussion the greater part of the fluctuations...

For Fisher, as Ziliak and McCloskey note[93], the result of a test is already a discovery.

There is no need, nor even room, for any model or the calculation of proportions of effects. A "scientific fact" is established "only" based on the level of statistical significance. The null hypothesis[94] "may include arbitrary elements and often does in more complex cases, such as those that assume the mortality rates of two groups of animals are equal, without specifying the exact rates."

This means that the null hypothesis does not have to be a well-tested model that the alternative hypothesis improves upon—it can simply be "pulled out of a hat." As a result, rejecting the null hypothesis provides no meaningful information because, from the outset, it is already known that the null hypothesis might be false, so why bother refuting it? What significance, then, can a test hold if it cannot be interpreted in Pearson and Neyman's framework as a relative probability?

Crucially, Fisher justifies his flawed practices through positivism, removing the need to find final causes[95]:

> the feeling induced by a test of significance has an objective basis in that the probability statement on which it is based is a fact communicable to and verifiable by, other rational minds. The level of significance in such cases fulfils the conditions of a measure of the rational grounds for the disbelief it engenders.

Of course, an "objective" computational procedure does not give what is actually important: the grounds to expect that similar phenomena will occur in the future, or that there truly exists an immutable order of causes arranged for effects. Given a dataset, I can calculate the mean value or the mean frequency, and these will be "objective and verifiable." But what of it? This does not allow

[93]Ziliak and McCloskey, "The Cult of Statistical Significance"

[94]Ziliak and McCloskey, *The Cult of Statistical Significance: How the Standard Error Costs Us Jobs, Justice, and Lives*, p. 223

[95]ibid., p. 222

usefulness for predicting future phenomena. Yet this exact illusion is falsely attached to labelling these frequencies as probabilities without any further explanation.

Not surprisingly, according to Gosset, a single statistical test proves nothing. In 1937, in discussing his agricultural experiments, he wrote[96]:

> obviously the important thing in such is to have a low real error, not to have a "significant" result at a particular station. The latter seems to me to be nearly valueless in itself. . . . Experiments at a single station [that is, tests of statistical significance on a single set of data] are almost valueless. . . . What you really want is a low real error.

Without building a model and testing relations of causes and effects, a statistical test is ultimately worthless. Proclaiming absolute "scientific facts" typically implicates both the rejection of a trivial and often false null hypothesis and the unjustified adoption of the other. This error is easy to identify, yet Fisher was eager to defend it. He even utilized similar reasoning as seen in the Vioxx case, suggesting that smoking does not cause lung cancer despite the correlation. Instead, he speculated it might be the reverse: a pre-cancerous state causes discomfort, leading patients to smoke more frequently to alleviate their distress[97].

As we will see shortly, this ties into some of Fisher's other beliefs. Fisher's most famous work as a biologist is titled *The Genetical Theory of Natural Selection*[98]. This book sought to combine the genetic theory of inheritance with Darwin's theory of natural selection, earning Fisher the reputation of being one of the greatest Darwinists in history—as asserted by Richard Dawkins. Commenting Wittgenstein's skepticism about Darwinism, the atheist philosopher Michael Ruse remarked[99]:

> It has occurred to me that when Wittgenstein made his comment in the Tractatus, he was still thinking very

[96] (Ziliak and McCloskey, "The Cult of Statistical Significance")

[97] Christopher, "Why the Father of Modern Statistics Didn't Believe Smoking Caused Cancer"

[98] (Fisher, *The Genetical Theory of Natural Selection*)

[99] Ruse, *Wittgenstein and Darwin*

> much in the Continental tradition – so his understanding of evolution would not be very Darwinian – more in the Romantic vision dating back to Schelling – prominent figure at the beginning of the twentieth century, Bergson – so perhaps there is some excuse for wariness But, by the time he made his later condescending comments, there had been a whole neo-Darwinian revolution – people like R A Fisher putting Darwinism (not just evolution) on a firm theoretical basis...

Let us then examine this "firm theoretical basis" of Fisher. Opponents of Darwin have easily acknowledged[100] the role of natural selection in evolution insofar as the extinction of individuals alters the frequencies of traits and genes. However, they pointed out that this does not explain the emergence of entirely new genes. For example: Darwinists often refer to the experiment involving the observation of the peppered moth near Manchester. The moth exists in both white and black forms, and as industrialization increased soot pollution in the area, the population of black moths grew (due to allegedly better camouflage against blackened tree trunks). When efforts were made after the war to improve air cleanliness and pollutant levels decreased, the black moth population also declined. Notably, both black and white variants of the moth had existed in the population from the beginning—no new insect arose, and no new traits or variants appeared within the population. Natural selection, they said, may explain the survival of the fittest, but it does not explain the arrival of the fittest[101].

Fisher addresses the problem of the emergence of new genes in Chapters VI and VII: "Variation as determined by Mutation and Selection"[102], aiming to support Darwin's thesis that population variability continuously increases due to the accumulation of beneficial mutations. This leads to the conclusion that the constant accumulation of small mutations results in the formation of new species. Fisher's key argument supporting this claim is that, if Darwin's theory is correct, we should observe greater variability in more numerous species, which Fisher attempts to demonstrate

[100] See p. 179
[101] The phrase was coined in 1904 by geneticist Hugo de Vries.
[102] Fisher, *The Genetical Theory of Natural Selection*, p. 108

using observations of 35 species of moths.

> A few years ago it was my privilege to make a statistical investigation of the extensive observations of Mr. E. B. Ford upon the variability of the wing colour in a number of species of night-flying moths. For thirty-five species the tints were sufficiently comparable to be represented on a single colour scale, and for these the observations, which included over 5,000 individuals, offered an exceptionally fine opportunity of examining the association between abundance and variability. It is essential in such an investigation to eliminate any tendency for one group of species to appear more variable than another owing to the peculiarities inherent in an arbitrary scale of tints. The data, however, were sufficiently copious to make it possible to eliminate this source of error, and after making the necessary allowances, it appeared that, in both sexes, the ten species classed as 'abundant' or 'very common' exceeded in variance the thirteen species which were less than common by between 70 and 80 per cent, the twelve 'common' species being in both cases of intermediate variability.

In 1937, he [103] published a similar study concerning birds. However, the problem is that, from the perspective of the methods presented, Fisher proved very little. Although he filled several pages with differential equations, he doesn't make significant use of them, limiting himself to testing an informal relationship between variability and abundance, and pulling out of a hat the null hypothesis that such a relationship does not exist. One should reject the true null hypothesis, which accurately reflects the current state of knowledge, and Mendel's theory of heredity suggests a simple mechanism for the reduction of diversity in smaller populations. It is known that offspring inherit one randomly selected allele of a given gene from their parent, while the other allele is lost. The number of copies of the gene in the population will therefore change

[103] Fisher, "The relation between variability and abundance shown by the measurements of the eggs of British nesting birds"

randomly: and the smaller it is, the more likely is the permanent loss of the gene. Consequently, the smaller the population, the faster the variability will decrease. Secondly, Fisher did not made much effort to reconcile the hypothesis with reality. He simply found an example that happened to work. Meanwhile, in general, it doesn't seem that the most abundant populations are particularly diverse. Sparrows, crows, and storks can be found over vast areas, and they are generally similar. Despite the fact, that the differences in the environment from England to eastern Siberia, where the Eurasian variety of sparrow occurs, should have produced some specific mutations. Thirdly, the main effect that the theory postulates concerns not variability, but rare constructive mutations, which are both too rare and too weak to be measured. Such an evidence is therefore very doubtful and it misuses mathematical laws. The Nobel laureate physicist Pauli summarized this problem in 1955 in one of his letters[104]:

> In discussions with biologists I met large difficulties when they apply the concept of 'natural selection' in a rather wide field, without being able to estimate the probability of the occurrence in a empirically given time of just those events, which have been important for the biological evolution. Treating the empirical time scale of the evolution theoretically as infinity they have then an easy game, apparently to avoid the concept of purposesiveness. While they pretend to stay in this way completely 'scientific' and 'rational,' they become actually very irrational, particularly because they use the word 'chance', not any longer combined with estimations of a mathematically defined probability, in its application to very rare single events more or less synonymous with the old word 'miracle

Therefore, Gosset's methodological principle of finding a strong, practically significant effect disappears in favor of postulating effects that are too weak for us to measure, but whose intensity we multiply by the infinite length of the time scale. It is not surprising

[104]Pauli, *Letter to N. Bohr - 15.2.55*

that Fisher was disgusted by the dictum acerbum about the necessity of dealing with effect sizes, which also likely contributed to his hostility towards E. Pearson and Neyman[105]. Similar aversion applied to the practice of balancing experiments, which Fisher reversed, advocating randomized experiments. While working at the Rothamsted Experimental Station and conducting agricultural experiments similar to Gosset's[106], Fisher directly recommended randomization, not balancing. Moreover (ibid.), Fisher did not cite or acknowledge Gosset's contributions, except perhaps for the discovery of the t probability distribution[107]. Gosset had previously written about both randomization and its shortcomings compared to balanced experiments. Incidentally, Fisher the Darwinist offers no balanced experiments either, so this method is also another objection to his claims. This is also connected with another erroneous view[108] that can be attributed to Fisher (and which we will see in finance) that "everything has a normal distribution". Confidence intervals in a randomized experiment are only valid if extreme outliers are very improbable. Because if such outliers happen more often, then means and correlations may depend in an uncontrolled way on a few such anomalies, no longer meeting the theoretical error intervals resulting from the law of large numbers. A balanced experiment is more effective here, since any anomalies can be analyzed in isolation for each corresponding pair of almost equivalent experiments.

The last five chapters of Fisher's 1930 work, "The Genetical Theory of Natural Selection," concern the Darwinian evolution of humans. Fisher proposes a full-scale application of the new science to address the problems of the mankind, hoping on similar success as achieved by electricity and thermodynamics, but even on a grander scale. We are talking about eugenics, notorious pseudoscientific attempt to control human evolution through forced artificial selection. We will describe this matter starting on page 168.

[105] Ziliak and McCloskey, *The Cult of Statistical Significance: How the Standard Error Costs Us Jobs, Justice, and Lives*, p. 221

[106] Ziliak, "Balanced versus Randomized Field Experiments in Economics: Why W. S. Gosset aka "Student" Matters", p. 181

[107] Ziliak and McCloskey, *The Cult of Statistical Significance: How the Standard Error Costs Us Jobs, Justice, and Lives*, s. 218

[108] ibid., p. 217

4 Final Causes, Finance, and Risk

4.1 Decision-Making Under Uncertainty

The predictability of systems encountered in physics rarely can be achieved in other fields, as the laws governing the systems that these fields study are not as simple, nor are they immutable and universal. It is a significant fact that some phenomena, such as electromagnetism, seem to be ordered in such a way that several related experiments can be repeated exactly, anywhere on Earth and at any time. Never before has Ampere's or Faraday's law been seen to fail us within its tested scope of validity.

Even a physicist cannot always expect such predictability, e.g., when trying to predict the weather, an earthquake, lightning strikes, or the height of waves hitting the shore. Although in studying these phenomena we see nothing more than the same known laws of physics and chemistry, this does not make phenomena such as lightnings and earthquakes predictable on a macro scale, especially with accuracy and certainty that we see in celestial mechanics and electrical circuits. The initial conditions of these systems are very complex (e.g., air and vapor movements are disturbed by every building and hill), and the equations are generally chaotic and unstable. As a result, the best weather forecasts work maybe two weeks ahead and are not always reliable.

Similarly, we cannot predict the place and time of a lighting, but we can anticipate some aspects of it, so to speak. For example, if we erect a metal mast, towering over buildings and electrically connected to the ground, then no lighting will strike the buildings next to it. The electrical breakdown will happen more easily between the clouds and the mast than between the clouds and the building. In this way, being able to predict very little, we can use it with great success, protecting ourselves from what cannot be controlled. This, in turn, is founded on question: what aspect of this system is ordered with respect to the future effect?

Other sciences, lacking unchanging core of constant and universal laws, must rely on this reasoning more strongly. Not only may a few replicated experiments not be enough to discover universal laws, but even many years of observation may become outdated when the process changes in a fundamental way, or when our understanding changes in light of new facts. In finance, after the 1987 crisis, the way options were priced changed significantly, and option trading strategies that had made profits for 20-30 years previously produced losses. Societies have changed dramatically under the influence of the industrial revolution and inventions such as the internet and penicillin. Some medical remedies, such as bloodletting, lobotomy, mercury salts, and tobacco, were considered to be supported by empirical evidence and scientific authority, but today they are considered ineffective or harmful. Similarly, the scientific understanding of diseases is still subject to revision to this day (e.g., the aforementioned consumption of animal fats).

4.2 Mathematical Tools as Laws and as Decision Heuristics

One of the important applications of mathematical modeling is the modeling of financial markets. It might seem that an effective mathematical tool for predicting the market is the key to easy and large profits in stock trading. Some economists claim that the market is random, but there are also people who are able to make long-term profits from trading.

There have been periods when simple trading methods worked and allowed for large profits. In 1983, for example, speculators Richard Dennis and Bill Eckhardt conducted an experiment. They recruited a group of volunteers and taught them a simple strategy for trading futures contracts. When the price of a contract exceeded the 20-day high, the contract should be bought. The bought contract was sold when the price fell below the 10-day low (and similarly, they entered short sales at the lows, which allows making money when prices decrease). The position size was selected based on volatility. Thanks to long price trends, Dennis' volunteers were able to make money.

Dennis, however, believed that the secret was not in the rules, but in the discipline of applying them. He said that anyone could come up with rules at least 80% as good as his, and that he could publish his rules in a newspaper and still no one would probably follow them. They require counterintuitive steps, such as sitting and watching a large profit evaporate, waiting for an even larger one, or ignoring sudden losses. Since the 1980s, trading has changed, thanks to high competition and the use of computers, but the example illustrates that financial markets have a teleological and game-theoretic aspect that is counterintuitive to the (modern) scientist. He might expect that "buy at the 20-day high" is some kind of market "law of nature," that after the high, prices will continue to rise (at least with some probability), and that if he replaces the high with a spherical harmonic, a neural network, or another better model, he will fit a better law and achieve greater profits.

But this is not how Dennis reasons. The rules do not say what will happen, but only what to do in order to earn more than you lose, on average. It is known that the market is a zero-sum game for speculators. Trends in futures contracts can be linked to the inertia of large investors who, wanting to secure their supplies of fuels, minerals, or agricultural products, buy huge quantities of them, which can take many days or weeks (due to limited liquidity[109] of the market). The other side of this huge transaction is needed, a seller who decides to sell only when seeing a sufficiently high price. Expecting this state of affairs, speculators want to grab something for themselves, buying to sell at a higher price, while the broker handling the large investor has the task of not allowing them to do so. He will therefore divide the buy order into many smaller orders with random sizes, times, and methods of execution (even sometimes reselling part of the contracts), to avoid producing statistical anomalies that will reveal his activity too early on. However, he cannot hide the fact that the price will start to rise, as his purchases create an advantage of buy orders, pushing the price up. This is what the speculator can see using the "breakout of the 20-day high," or other similar method. This is only a quarter of the success, however, because the "whales," having time and resources, can "shake out" the speculators, painting profits on their accounts, and then suddenly dropping the price down. The speculator must eventually sell the contract at a loss when the market goes against him (because his hypothesis is wrong), but he should

[109]Liquidity is the ability to buy or sell large quantities of securities at the lowest possible transaction costs. If we can buy 100,000 shares at \$101.10 and sell 100,000 at \$101.00, the market is quite liquid. If we can only buy 500 shares at \$110 and sell 400 at \$100, it is not liquid – and if we want to buy 2,000 shares at once, we may pay, for example, \$150 for them.

not be outsmarted and do it too early, nor should he, blinded by greed, buy too many contracts and be forced to do so as a result.

4.3 Game Theory Elements in Black Monday

The laws of physics have remained the same for thousands of years. Financial markets, as is typical of highly complex systems, exhibit sudden transformations where phenomena and effects that were insignificant for many decades suddenly become paramount. To understand what might happen, one must distinguish between the established and predictable foundations of the market's operation and what we can infer from 10 years of historical data. An example of such a phenomenon with a considerable impact on the entire population are financial crises, such as the ones in 1987 and 2008. Black Monday of 1987 was a very sharp drop in the price of the main American stock index, S&P500, by about 20 in a single day. It is attributed to two factors strictly related to trading and investing (in the sense of not being related to economic factors)[110]. The first is an investment vehicle called portfolio insurance, offered to clients who already had significant investments in the stock market. The issuer of the document accept obligation to protect the client against excessive losses by selling options or futures contracts on the stock index when the market falls. It was a popular instrument during the bull market from 1982 to 1987, when some investors wanted to protect their profits. Futures contracts, compared to stocks, had the advantage that they could be sold faster than stocks and at lower transaction costs. However, this worked under normal conditions, when there were many buyers at a set price who were not afraid, for example, that they would immediately lose on their purchase. The plan, therefore, has the drawback that its success depends on the other party to the transaction. For that reason the price is not a continuous value and can fall by arbitrarily large amount, if the buyers decide so, placing orders on the exchange. However, such an option was not considered possible. Another factor that caused Black Monday is statistical arbitrage trading, again heavily based on index futures contracts. Investing in stocks has a few problems: first, liquidity is often not very high,

[110]Maley, "The real reason for the 1987 crash, as told by a Salomon Brothers veteran"

and transaction costs are high. Buying a large number of shares of a smaller company in the S&P500 index at once can move the price, reducing future profits. Moreover, stocks can only be bought with cash, which must be borrowed if you don't have enough (or, analogously, you can borrow stocks to sell them and buy them back cheaper, profiting on the declines), which is further cost expensive. A futures contract on stocks is an agreement to deliver stocks at a future date. To buy or issue it, only a cash collateral of about 10% of the contract value is required, which enables cheaper and easier trading. It can be expected that the price of a contract on S&P500 index stocks should follow the index itself, which is a weighted average of the basket of stocks of the largest companies. Statistical arbitrage consists precisely in selling (or issuing) contracts when their price exceeds the index, and buying them when the price of the contract is lower than the index.

Why, then, was statistical arbitrage a problem on Black Monday? It is source of underestimated risk, which is very easy to overlook: this strategy is badly exposed when the index drops and the contract price drops faster. "Arbitrage" in the strict sense should adopt market-neutral position, by buying contract while shorting same amount the stock: but shorting the stock is much more expensive, so instead only contract is being traded. For that reason, these strategies bought contracts when the contract price drifted away from the index downwards, counting on it to return to the index. If the price went too far, causing too much loss, the contracts had to be sold at a loss, but this was extremely rare. The sudden drop on Black Monday, however, triggered a snowball effect, as everyone had to close positions and sell contracts at once, driving the market down further and further. The sellers were quickly joined by portfolio insurance issuers, having to cover huge portfolios of stocks that were rapidly losing value (cut the loses). Both were, in a sense, forced into this action, because their risk exposure was much greater than their real funds, thanks to the use of leverage (you can "buy" $50000 contract value while having only $5000 in cash) —if the value of our account shows zero or less, the broker forces us to close the position (sell the contract, or cover the short sale). Such an effect, although it had not been significant for many years before, suddenly became crucial, wiping out accounts and shaking the entire economy. Historical data was not relevant, as the mechanisms of the game had changed with investor behavior, the introduction of new investment vehicles, and electronic trading

4.4 The 2008 Crisis, Misuse of Mathematical Models, and the "Pseudo-Nobel"

Another example of a crisis, closer to our own time, is the 2008 crisis. It shares common ground with 1987, both in terms of investing in toxic assets with leverage (this time credit default swaps (CDS)), and in the incorrect use of mathematical models. For the purposes of this book, it is significant that financial experts echo very similar mistakes as Ronald Fisher and the positivists, confusing the model and prediction with the calculation of parameters on prior data. Wall Street Journal journalist Roger Lowenstein wrote in 2000[111] as follows:

> Economists later figured that, on the basis of the market's historical volatility, had the market been open every day since the creation of the Universe, the odds would still have been against its falling that much in a single day. In fact, had the life of the Universe been repeated one billion times, such a crash would still have been theoretically 'unlikely'.

Let's examine the phrase "based on the historical volatility of the markets". The conclusion that the price drop of Black Monday was impossible requires the assumption that the historical standard deviation (interpreted as volatility) will be equal to the future volatility, as well as that the returns (daily price movements) will be given by a normal distribution. The normal distribution is a distribution with a characteristically rare frequency of extreme events, which appears naturally as, for example, the distribution of the sum or average of a very large number of statistical trials (e.g., the distribution of the sum of 100 dice rolls). In finance, however, it is mainly used because various things like linear regression residuals or distribution of sample correlations become easy to calculate. The conclusion, therefore, is based on two false assumptions, which are nevertheless useful because they are met from time

[111] Jennings, *Black Monday: The Improbable Crash, Its Causes, And Timeless Lessons For Investors*

to time and provide a useful point of reference. Unfortunately, the establishment interprets them as absolutely true, making a mistake similar to the one with which Fisher stung all of statistics and which boils down directly to the rejection of the concept of final cause in the question: which aspect is ordered with respect to future effects, and which is not.

This error played an important role in 2008, about which Nassim N. Taleb, author of several bestsellers, wrote a short publication[112]. Among the main causes of the crisis, he points to:

- The reward structure for managers, which rewards hiding the risk of extreme events.
- The promotion of methods that help hide the risk of extreme events, such as VaR.
- Increasing ignorance of this type of risk, thanks to the activities of universities and regulators.

Investment fund managers generally receive a bonus in the form of a commission on profits over annual periods, while not directly bearing the risk of losses. Taleb points out that this system allows for easy profits at the expense of investors, as long as the manager makes trades that give him repetitive, small profits most of the time, while risking very rare, huge losses. This includes various investment vehicles that we have already mentioned, as well as issuing put options, performing carry trades (borrowing francs or yen and investing them in bonds in other countries where interest rates are high), and others. Here is how this works: this type of strategy could be earning a lot of money for a few years, and its executor should receive a commission, then the strategy can even have a large loss.

In turn, Value-at-Risk, abbreviated as VaR, is a risk analysis technique based on the idea of the aforementioned economists. The standard deviation of daily returns σ should be calculated. And two standard deviations 2σ is precisely the VaR, the limit that our losses should not exceed in 95% of trading days. Based on this limit, we are to adjust the size of our investment and risk. VaR, notably, ignores the fact that the past is not always identical to the future,

[112] Taleb, *Why Did the Crisis of 2008 happen?*

and that prices do not follow a normal distribution in the tails of the distribution, and often market declines are much larger (Black Monday is precisely a drop of 10 VaR). The usefulness of such a measure also relies on the assumption that successive returns are relatively independent of each other and periods of growth and decline alternate. It won't help us that on a given day we lose only 1 VaR, if for the next two weeks we lose a similar amount every day (and this is precisely what happens in the case of stock market crashes).

This is related to another, more general problem, which Taleb points out (ibid.):

> I said that knowledge degrades very quickly in the tails of the distributions, making tail risks non-measurable (or, rather, impossible to estimate —"measure" conveys the wrong impression). Yet vendors have been promoting method of risk management called "Value at Risk", VaR, that just measures the risks in the tail! it is supposed to project the expected extreme loss in an institution's portfolio that can occur over a specific time frame at a specified level of confidence (Jorion,1997). Example: a standard daily VaR of $1 million at a 1% probability tells you that you have less than a 1% chance of losing $1 million or more on a given day.

There are various modifications of VaR, for example, "conditional VaR," which although presented, he says, as the 'maximum' loss, in practice are not such "in an open-ended exposure," because if you have already lost $1 million on a given day, you can still lose another $5 million. So, simply put, "VaR encourages risk-taking in the tails of the distribution," especially excessive risk.

To the answer that "we have nothing better," Taleb replies that the current situation is worse than nothing, because of the "iatrogenic" damage resulting from illusory competence. Investors are willing to risk much more when they think they understand the mechanism of the market, and a false picture is amplified by linguistic manipulations:

> Calling these risk estimation "measures" create confusion in the mind of people, making them think that

something in current existence (not yet to exist in the future) is being measured —these metrics are never presented as mere predictions with an abnormally huge error (as we saw, several orders of magnitude).

And this is precisely the distinction that we keep returning to. The distinction between what is seen here and now, and what is only a future expectation and the basis for that expectation. This is, in turn, the same type of error as with Fisher and the positivists in the case of the principle of induction. Interestingly, Taleb points out that this cardinal error came primarily from universities, from the establishment that attributes to itself the leading scientific and educational role (such theories have even been awarded the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel, which the author usually calls the "pseudo-Nobel").

4.5 Risk Analysis and the Use of Models in Decision-Making

Taleb's popular books, "The Black Swan" and "Antifragile," present a theory of modeling and decision-making, aiming to address the above problems. The goal of financial risk analysis is to prevent bankruptcy or devastating losses, while simultaneously taking risks that allow for the largest possible profits. His focus is not necessarily about trading strategy, but rather about how to manage many such investments over a long period of time, recognizing that sometimes we will encounter sudden, rare anomalie.

That is the use of "antifragility". A "fragile" system is characterized by the fact that under the influence of an unfavorable anomaly, losses grow at an accelerating rate, leading to huge loss, if only the anomaly is large enough. A "robust" system behaves in such a way that losses are limited and do not grow with the size of the anomaly. An "antifragile" system is the opposite of fragile: it is robust, having limited losses, but also profits accelerate and grow greatly if the situation turns in our favor. Holding a large part of capital in stocks of large companies, to get, for example, dividends, is not very attractive from this point of view, as it provides relatively small, fixed profits, while exposing to uncontrolled risk during rare crises. The same applies to the so-called carry trade, where a loan is taken in a currency with low interest rates and invested in bonds of a country with high interest rates (denominated in its currency). Unfortunately, there is no free lunch here: low rates are characteristic of "safe" currencies that are always in demand, such as the yen or the franc, and which rise relative to other currencies in situations of market uncertainty (and our carry investment loses a lot of money in this situation). Taleb recommends rather using 10% for risky investments that can grow 10 times, or lose everything, and keeping the rest of the money in instruments without risk. Among financiers, there is a somewhat similar concept of α and β: β is generally profits correlated with the growth of the US stock index, i.e., earning or losing when the wider public earns or loses. α, on the other hand, earns independently of the stock market and allows flatter profit curve when added to the investments in stocks. However, this is not a very effective method when the really important problem is avoiding extreme losses, not whether we are earning at a steady pace[113]. And the behavior of instruments in the tail of the distribution may have little to do with the correlations that occur on a daily basis. For instance, Markowitz's portfolio theory (which Taleb speaks of very negatively (ibid.)) is based on the standard deviations and correlations of various investment instruments, not taking into account the case that these correlations can change rapidly in extreme situations. Similarly burdened is the Sharpe ratio, expressed as the average daily rate of return (daily change of value) of an investment divided by the standard deviation of returns. Risk is not well estimated either by the standard deviation of profit rates, or by the standard deviation of loss rates. A key issue is, for example, how much an investment can lose before we have to close it, so the cumulative loss and extremes of it also count. Furthermore, no risk estimation whatsoever can be performed relying on historical price data alone, while neglecting crucial mechanisms of the system. Carry-trading Swiss franc versus euro in 2014 was very risky, because a fixed exchange rate was artificially enforced by

[113]One of many arguments is provided by simple compound interest. Let's assume you have $1000. If you lose 50% and have $500, you need a 100% return to break even. If you lose 90%, you will need a 900% return to recover the loss.

Central Bank. Short-selling large amounts of stock is extremely risky, because sufficiently large losses may trigger a short squeeze. Assume that we, for instance short a stock at $100, and are forced to liquidate at loss at $120. If we have large position, it could be much bigger than number of sell orders in the order book and we may end up liquidating it at $200 or more, ending up in large debt (example of it is Porshe stock squeeze in 2008).

Taleb's analysis can also be applied to individual instruments. A few years ago, it was possible to buy shares of Polish state-owned companies (JSW, PGE, TAURON) at a price-to-book value ratio of 0.1-0.2. The companies cost very little, not having presented value for dividend investors for a long time (dividends are based on profits, which were not available), nor making prospects for a stock market boom. At the same time, it was clear that they would not fall much lower (they would have to go bankrupt, which the government would not allow, or be worth a small percentage of their real-world assets), and possible turbulence in the commodity and energy markets could cause a rapid, several-fold increase in prices, which is precisely what happened later, for example, during the COVID pandemic.

5 Final Causes and Physics

5.1 The Scientific Method of Final Causes in Physics

The history of physics encounters a paradox. Physics undoubtedly discovers some kind of truths: we know that many theories and experiments work everywhere and always with great accuracy, and that our knowledge is greater than it was 300 years ago. On the other hand, we consider many historical theories to be false or partially false, even though there was once evidence to support them similar to that in the case of modern theories. Newton's theory of gravity was replaced by the General Theory of Relativity, for example.

There is a solution to the problem, which Duhem pointed out. Not all in the old theory is refuted when a new one is discovered. Almost all theoretical interpretations and results that accurately predicted phenomena in Newton's theory remain correct and almost identical to this day. Newton's theory, understood as a model describing the universal ordering between measured quantities with respect to future effects, along with a set of relevant experiments and observations, has not been refuted in its scope. It is merely interpreted as a special case of General Relativity and quantum physics. What has been refuted are various analogies, explanations of efficient causes, and generally the image of looking at the world in the manner of "gravity is an action at a distance," "matter is like rigid balls subject to Newton laws," etc.

Physics, therefore, discovers final causes: the ordering of phenomena with respect to future effects - and this constitutes its lasting and ever-growing body of truths. That is: knowledge of the order of the world, which physics is describing with increasing accuracy. The applications of physics, which have established the exact sciences as one of the most important foundations of civilization, also depend on this knowledge. How to build an engine, a voltmeter, or a telescope? The design is founded on physical interpretations that predict the behavior of individual components and the entire system, from which equations are derived that allow calculating parameters and assessing whether the system will function properly. The torque and power of an electric motor, for example, can be calculated from the forces acting on the coils according to the laws by Ampere and Faraday. Or a telescope can consist of two convex lenses, arranged coaxially at a distance equal to the sum of their focal lengths. And again, the above approach is exactly the same as it was 100 or 200 years ago, regardless of the fact that we understand light differently since then.

Therefore: the key to physics is dealing with final causes, i.e., the global ordering of phenomena with respect to future effects. All other types of judgments in physics are made on the basis of final causes. If in the first half of the 20th century it was believed that an atom consisted of a small, heavy nucleus surrounded by a cloud of electrons, it was believed so on the basis of the cross sections that Rutherford obtained (and not because someone saw this atom). Seeing, after all, is also dependent on interaction with light, If it was believed that the matter of distant stars is identical to the matter on Earth and in the Sun, it was based on a comparison of the emission spectra of light from these stars, for example.

If we say that iron is made up of a large number of identical atoms, a large body of research and theoretical interpretations stands behind this thesis. By accurately measuring the masses of substrates and products of various chemical experiments (according to Lavoisier's methods), we can determine that iron is a pure element, since we cannot break it down, it can only be combined with oxygen, an acidic residue, or another substrate. The properties of different elements, on the other hand, reveal a characteristic regularity, which Mendeleev was first to propose: iron, for example, is more reactive than gold or silver, and less so than sodium or magnesium. It also conducts electricity and heat, which is explained by the presence of free electrons. X-ray spectroscopy experiments, in turn, suggest that metals are made up of a network of very regularly arranged particles. X-rays scattered on a metal sample lead to the formation of specific diffraction patterns. Mass spectrometry, separating ionized iron particles, is able to determine that almost all have a mass of 56u or 55u. The very statement that metal is made of atoms serves only as a visual analogy, which is useful in explaining hypotheses, but can be misleading even in relatively simple things. It is not true to compare them to packed balls in a situation where matter turns out to be a void in which, thanks to electrical and atomic forces, very small points are suspended. Nor is it true that they are balls, or that they have any appearance at all in the sense that objects of the macroworld have. Appearance, after all, is also a phenomenon composed of many interactions of matter particles and photons, according to unchanging laws, and interpreted by our visual senses.

5.2 Order and Contingency—Duhem's Thesis on the Origin of Physics in Theology

To the general priority of final causes, a few other postulates must be added, which distinguish modern physics from physics practiced in the antiquity, as I have already written in "Order and Contingency"[114] based on the discoveries of Pierre Duhem. Firstly: physical theory describes an unchanging and universal order between measured physical quantities. The fact that this order is maintained in our world is behind the great success of physics, since it is possible to test hypotheses with great precision and incrementally improve our knowledge, assuming that once discovered relationships remain true always and everywhere. An experiment carried out 50 years ago in Japan can generally be verified today, on the other side of the world, without any modifications.

Secondly, the world and its ordering are contingent. It is not necessary (in a sense that it does not follow from logical demonstration) that the world exists, nor it is necessary for any physical hypothesis to be true a priori. On the contrary, for every accepted physical theory, a large number of modifications can be invented, including those that are consistent with all known experiments, and will differ from each other only in their predictions of unknown results. It follows, therefore, that the general form of the theory is based on a type of final causes: established relationships between measured quantities. Everything else (in the decision-making process) has to be established by experiment and observation, i.e. the prediction of previously unknown results and consistency with what is already known.

As I wrote, both principles originate from Catholic theology. The thesis of contingency is suggested by the article of faith that God created the world being free from necessity, but it was fully

[114] Zawistowski, *Order and Contingency*

adopted when the scholastics realized that they could not accept any theory postulating logical necessity that would limit God's power to create something completely different from what it is. This caused them to reject the key theses of Aristotelian physics. The thesis of the ordering of the world according to unchanging numerical relationships was suggested thanks to the interpretation of Scripture, including the Book of Wisdom, which says that God made everything according to measure, number, and weight, and that He ordered everything from the beginning to the distant future.

I will give a few examples of the application of the above theses. Greek science was shrouded in myths and organic world picture (ibid. 42). Even if we were to remove that, with everything that distinguishes Greek science from modern physics and focus on few scientists using mainly mathematics, e.g. Archimedes, Eratosthenes, or Ptolemy, a key gap still remains. Greek scientists could not invent abstract, complex physical quantities, knowing only those that everyone knows well from everyday experience. Volume, length, time, angle, azimuth of stars in the sky—and that's it. There is no temperature, acceleration, or energy. There are no derivatives and integrals. I wrote more extensively about where they came from. For example, the Franciscan John Bassols (ibid., p. 55) was the first to deduce that heat is a quantity, not a quality. If we were to bring three cubic blocks together, one cold and two hot, he says, it would produce more heat in the cold block than one hot block touching the cold one. Heat, therefore, is additive and cannot be a quality, as the Aristotelians wanted. Similarly, Buridan (ibid., p. 65), through the interpretation of experiments, showed that there is a "quantity of motion" of bodies. It is an internal property of the body, because it is impossible for the air itself to lift heavy stones, or to push a rotating grindstone. Oresme (ibid., p. 82) discovered the quantitative relationship between instantaneous velocity and distance in accelerated motion, inventing for the first time a kind of graphical integral. The geometric demonstrations used by Oresme and the scholastics of Merton College were the basic mathematical tool until the 18th century. Newton in "Mathematical Principles of Natural Philosophy" operates precisely on them, not on algebraic equations. On the basis of Aristotelian physics, Oresme also showed that gravity must depend on relative position, not absolute position (ibid., p. 80). Numerous scholastics[115] developed the doctrine of syncategorematic infinities, which underlies differential calculus, including modern rigorous calculus of Cauchy[116]. Furthermore, Cauchy attributes the main cause of the problems of Lagrange and 18th-century mathematicians[117] to the improper understanding of infinity.

5.3 The Distinctiveness of Physics from Other Sciences

The above thesis immediately implies a key conclusion, which has left its mark on all disputes in the philosophy of science of last 300 years, and which provides further proof for the thesis that physics began with the scholastics. Physics is different from medicine, physiology, geology, or economics. It does not deal with sensory impressions, but with abstract interpretations. These interpretations deal not with specific things, but with the relationships between many of them. Physics does not describe the entirety of objects, but measures a selected aspect. It is not limited to what is seen here and now, but discovers relationships that are true always and everywhere, with precision incomparably greater than the precision of the senses.

Physics, in order to achieve its ascension, had to undergo a profound transformation: scientists broke away from operating with sensory impression and representations of objects that man sees in his mind, and learned to conceptualize the universal, unchanging order of the whole world, in the language of abstraction and symbols. Other sciences have never undergone such a transformation, nor can they benefit from it, because they have a different goal and different difficulties to overcome. Biomedical research deals with a complex and changing system; not a simple and unchanging order, for example.

Why should this confirm Duhem's Thesis about the origin of physics in theology? Because opponents do not understand, or do

[115] Duhem and Ariew, *Medieval Cosmology: Theories of Infinity, Place, Time, Void, and the Plurality of Worlds*, p. 45-72 and p. 78-89

[116] Zawistowski, *Differential Calculus made clear (by its original inventor): Cauchy's theory of infinitesimals*

[117] Cauchy, *Sept leçons de physique générale*, p. 25

not want to understand this truth about the distinctiveness of physics, thus accepting various very erroneous and harmful views. Among the enemies, two are particularly prominent. Scientists and positivists, naively enchanted by physics, believe that all other fields should be reformed along the lines of physics (or, more correctly, along the lines of some surrogate). One fruit of this work is the corruption of the scientific method, especially in fields dealing with complex systems such as economics, medicine, or risk analysis (which we have already discussed in more detail, see the chapter on this from p. 66). Another consequence are various plans to repair the world and society by use of force (about which in the last chapter).

The second important trend in the philosophy of science grew out of modern irrationalism. It undermines the progress of physics as a construct of mob psychology, and its main father is Thomas Kuhn. Kuhn's ideas logically follow from attempts to erase the legacy of the scholastics in physics and to defend the thesis that between the Aristotelians, and Galileo there were almost no scientific discoveries, and some sudden irrational breakthrough occurred. However, by undermining the progress of physics in this way, the Kuhnians themselves become heralds of Duhem, proving that they have no explanation other than no explanation, masked (in the light of the theory of meaning that I have presented), by empty words.

5.4 Positivism and Scientism as a Social Program

Scientism is a program to reform philosophy and society in a "scientific" way, as in the exact sciences. As we have already pointed out, however, physics and related sciences have been optimized for dealing with the unchanging ordering of the world according to measure, number, and weight. A method that works well in physics does not necessarily work elsewhere. Physics (as also Hayek has pointed out, see p. 152) got rid of operating with mental images, which we use on a daily basis, in favor of abstraction, symbols, and equations. However, these same images are effective, for example, when a physiologist studies the nerve connections on which the sensation of the hand or foot depends, or when we ask why people in a certain city prefer bananas to apples. Moreover, in economics and sociology it is impossible to assume that some numerical observables will reveal to us equally precise and unchanging laws as those discovered by Newton.

Positivism is a more specific case of scientism, taking the above error as a fundamental dogma, which is why the two terms can often (though not always) be used interchangeably. It originates from Auguste Comte, whose idea one of his followers summarizes as follows[118]:

> Comte accomplished by taking as the criterion of the position of each the degree of what he called "positivity", which is simply the degree to which the phenomena can be exactly determined... **The degree of exactness or positivity is, moreover, that to which it can be subjected to mathematical demonstration, and therefore mathematics, which is not itself a concrete science, is the general gauge by which the position of every science is to be determined**. Generalizing thus, Comte found that there were five great groups of phenomena of equal classificatory value but of successively decreasing positivity. To these, he gave the names: astronomy, physics, chemistry, biology, and sociology.

In other words: each science is as "valuable" as much it resembles physics, or rather, "physics" as understood by the author. Metaphysics, or ethics, are the most dissimilar, and therefore worthless. Scientism takes its origins in the French Enlightenment and the French Revolution (about which we will say more later), so it will not surprise us that positivism emerged shortly after from the ashes of that Revolution. Comte's mentor was the scientist and socialist Saint-Simon[119]. In 1803, he invented a new social system, in which the Council of Newton, composed of scientists and artists, was to be the highest authority on Earth. In every place, Temples of Newton were to be erected, serving to implement the council's guidelines and rituals of the cult of science. The program was developed by

[118] Ward, *Outlines of Sociology*, p. 6
[119] Jaki, *The Relevance of Physics*, p. 468

his student Comte; There is indeed key difference between Saint-Simon and Comte. While the former at least recognized science as a golden standard to which everything else should be bent, Comte also intended to reorganize science according to his new "positive philosophy", and his followers in the 20th century eagerly shared this intention, Fr. Jaki says. As for the secular eschatology, he approved of it all the more[120], seeing in "science" "a new spiritual power" which was to become far more important than the medieval Church once was.

As for the reform of science, to justify his mandate to repair the world, Comte needed to assume that physics and astronomy provide ultimately true and certain rules[121], to further suggest that similar rules could also be identified in his social engineering. The strange connection between social engineering and the problem of the stability of mechanics (idea shared by e.g. Laplace[122] and generally a fruit of the French Enlightenment) is also adopted by Comte[123]:

> It is no exaggeration to say that Social Physics would be an impossible science, if geometers had not shown us that the perturbations of our solar system can never be more than gradual and restricted oscillations round a mean condition which is invariable. If astronomical conditions were liable to indefinite variations, the human existence which depends upon them could never be reduced to laws.

Incidentally, the Solar System is not perfectly stable, nor is there any proof that it is, contrary to the expectations of aforementioned Laplace. It is generally problematic to expect that science has already said the last word in something, because theories are constantly being developed. Although much was understood before 1900, this did not prevent the great discoveries of the next 50 years. Mechanics and electrodynamics described almost all phenomena accurately, but in rare and seemingly insignificant anoma-

[120] Jaki, *The Relevance of Physics*, p. 469
[121] ibid.
[122] Zawistowski, *Order and Contingency*, s. 101
[123] Jaki, *The Relevance of Physics*, p. 470

lies[124] scientists found altogether new theories. This is an astonishing property of the contingency of the world, that although we already know a great deal, it does not mean that we are close to the end, because there remains a large number of possible modifications of each theory. The great merit of scholastic philosophy was the discovery of this truth in advance, while positivists do not understand it even having modern physics before their eyes. Comte, therefore[125], was convinced that we will never know what distant stars are made of, and studying them will only lead to "a series of disjointed speculations, as irrational as they are useless," and attempts to explain molecular bonds using electricity are similarly worthless[126].

The question arises whether earlier scientists could have followed such a "scientific method." Comte's follower J. S. Mill, however, was certain[127] that earlier scientists were in fact carrying out the positivist scientific program without knowing it. Newton, for example, was supposed to have followed the method of Francis Bacon and to have used the "principle of induction," which is a key issue for positivists, accompanying them until the 1950s. Bacon recommended a scientific method in which data on the coexistence of various phenomena were collected, and, based on patterns in these data, general rules were formulated, using induction. For example, we have seen many times that fire consumes wood, wood floats on water, and glass is brittle; so it seems we can assume that this always happens.

Such a method does not allow to build a physical hypothesis in the modern sense. The hypothesis must be invented in advance, and on its basis, several different experiments should be planned and calculated. Observing the same phenomenon many times will not, in itself, produce physics. Almost all aluminum objects that are dropped fall to the Earth, but this does not mean that an airship cannot rise into the air. And to explain this fact, it will be useful not to observe flying objects many times, but rather the

[124]two small clouds, as Kelvin said in 1900: problem of divergent radiation spectrum and that of relative motion of ether, hypothetical medium for electromagnetic waves.
[125]Jaki, *The Relevance of Physics*, p. 472
[126]ibid., p. 474
[127]ibid., p. 478

mathematical law of buoyancy, discovered incidentally during the observation of objects immersed in water. The fact that fire consumes wood does not mean that there is a general, always fulfilled law of this kind (e.g., African azobe wood burns very poorly), nor that damp wood burns. Even the old physics of Aristotle, which I described in the first chapters of "Order and Contingency," showed much more competence in this regard, also because a small set of rules, such as those about the four elements, is enough to describe many *diverse* phenomena. Not only that wood floats on water and stones sink, but also the melting of hot metals, or the fact that salt water evaporates leaving salt, and condensed vapors form fresh water. The Aristotelian image of the world, its conceptual apparatus, was not very efficient, true. But what is better? A model that fit the data that were available, or the complete lack of any model or the need to build them?

5.5 The Philosophy of Science of Ernst Mach

Among 19th-century thinkers, Ernst Mach is certainly worth mentioning. Although he is often classified as a positivist, he surpasses other representatives of the trend in sophistication. Mach believed that theory is nothing more than an optimal description of sensory data, a certain economy of thought about sensory impressions. This thesis is useful insofar as it rightly denies the validity of hypotheses that easily accept some interpretation of physical theory as the ultimate truth about the entire world, such as Enlightenment mechanicism and the Copenhagen interpretation of quantum mechanics. At the same time, theory is not only an economical description of data; theory is supposed to predict new, unknown facts and be consistent with all measurements, so that we know it to reflect true order between measured quantities. And on this point, Mach is wrong. General Relativity, for example, does not prioritize any economy of the description: it is very distant from everyday experience, and all calculations based on it are very complex. Moreover, almost all mechanical phenomena are well described by Newton's theory, and it is Newton's theory with a set of ad hoc corrections that would be a much simpler description of gravity. However, this would not meet the standards of physical theory, precisely because of the priority of final causes and the universal order of the world.

Einstein himself, by the way, referred to Mach's philosophical observations on mechanics, but he developed a very critical opinion of Mach's philosophy of science. In 1922, he went to Paris, where he discussed publicly with a panel of well-known French philosophers[128]. Asked about his relationship to Mach, Einstein replied that Mach's methods might have allowed building a catalog, but not a system, and that he was a good researcher of mechanics, but a terrible philosopher. And this is precisely the objection that we are concerned with: a catalog of facts is not a physical theory. On another occasion (ibid.), he wrote that Mach's philosophy is only suitable for killing vermin, and cannot give birth to anything living.

It is worth mentioning other details of Mach's worldview in this context, as he was hostile to belief in God and Christianity. It is difficult in such a situation to be a historian of mechanics, when almost all of its constructors saw mechanics as embedded in the philosophy of final causes and theology (including Newton[129], Euler and Maupertuis[130], and even the informal leader of the Enlightenment, D'Alembert[131]). If, therefore, we want to get rid of this key foundation of mechanics, that it is primarily a description of the ordering of causes with respect to effects and measurements with respect to predictions, then the above erroneous philosophy, erasing the reality of physical theory altogether, seems very attractive. Incidentally, this is precisely what Ernst Mach does. Fr. Jaki wrote about it as follows[132]:

> As a scientist Mach could give silent treatment to metaphysics and especially natural theology by silence, but as a historian of science he could not. In particular, as a historian of mechanics Mach could not ignore the fact that from Descartes to Maupertuis the foundations of mechanics were anchored in natural theology, that is, the philosophical study of ultimate in the intelligibility of being.

[128] Jaki, *The Road of Science and the Ways of God*, p. 185
[129] Zawistowski, *Order and Contingency*, p. 85
[130] ibid., p. 90
[131] ibid., p. 104
[132] Jaki, *The Road of Science and the Ways of God*, p. 156-157

> How Mach was to handle this question was clear from a remark of his chapter "Theological, Animistic, and Mystical Points of View in Mechanics," in The Science of Mechanics. There he suggested that no chance reference to a living scientist would be a reference to a real believer.65 Had Mach been attentive to the facts, he would have had to note that believers even in his time still outnumbered unbelievers among scientists and the more so the higher the quality of their science. The massive evidence for this was available in the pages of a German theological periodical and also in book form. It could have been utilized in the last three editions of The Science of Mechanics, but Mach could hardly be factual in these matters, as he abhorred belief in God and nourished hatred for Christianity, the most positive form of that belief.

In his final years Mach adopted Bhuddhism[133], which is strongly founded in irrationalist and subjectivist philosophy, and of which Mach spoke as a most scientifically fruitful religion. No wonder that strongly anti-rationalist element is found among his successors, especially Kuhnians, claiming that physics is a construct of crowd psychology. The first steps towards this conclusion were already taken in the 19th century, and among these steps we can also place Mach's philosophy.

5.6 The Principle of Induction and Neopositivism

Positivism revived after the First World War in a form seeking to eliminate Christianity and philosophy, and to solve all their problems in a so-called scientific way. I have already mentioned this program in connection with the theory of language, which, incidentally, was supposed to show that philosophy deals with meaningless clusters of words. This theory had to rely on some criterion of empirical verification of concepts, and that criterion is precisely the "principle of induction."

[133] Jaki, *The Road of Science and the Ways of God*, p. 159

It is closely related to the corruption of the statistical method, which I have already presented. The principle of induction is analogous to Fisher's idea. to Fisher's idea in the field of statistical method, which I point out on p. 87, that any calculation of frequency or correlation can be considered a universally true, objective scientific fact. Neopositivism proceeds similarly, justifying concepts and sentences through the repeated observation of some sensory impressions.

Even in the circles of liberal philosophy, the main problem with this is well known on paper, as demonstrated by the Enlightenment philosopher Hume. The principle of induction in the given form cannot have any rational justification. However, neopositivists tried to turn the dispute to their advantage in a non-rational way, as for example, Reichenbach, cited by Popper[134]:

> Some proponents of inductive logic—like Reichenbach—are concerned with showing that "the principle of induction is accepted without reservation throughout science, and therefore no one can seriously doubt it in everyday life either.

and

> This principle determines the truth of scientific theories. Eliminating it from science would be nothing less than depriving science of the means to determine the truth or falsity of theories. It is clear that without this principle, we would have no right in science to distinguish theories from the capricious and arbitrary creations of the poet's mind.

Popper wrote an influential refutation of positivism in the cited book. He pointed out that science (primarily referring to physics) relies on accurate predictions that put hypotheses to the test. Having established this, it follows that the principle of induction is not only unjustified, but anti-scientific. Good hypotheses are testable hypotheses, and therefore those that predict something that we

[134] Popper, *[The Logic of Scientific Discovery] Logika odkrycia naukowego*, p. 22-23

would not expect to see, and therefore improbable. The probability of hypotheses in light of the principle of induction is therefore[135] high for the most pseudoscientific hypotheses, and low for the correct ones. This does not mean that probabilities do not apply to hypothesis testing[136], it is the "principle of induction," needed as a principle of verification (so that individual statements are verifiable) that bears the greatest blame for the error here. Positivists cannot abandon it without the collapse of their claims as to what anyone is allowed to say and write.

Popper's critique is worth citing, since it comes from a "fraternal" atheistic philosopher, who also did not fail to speak critically about the authoritarian impulses of "scientific" scientism, at a time when positivists were often socialists and communists. At the same time, this critique needs to be supplemented, as it does not provide any details about the method of practicing physics, the difference between physics and other sciences, nor what in theory is or is not refuted—that is, mainly about final causes. Therefore, it is more useful to focus further on the errors that Einstein[137] and Duhem pointed out, and on the issue of statistical methods.

Why, then, is it impossible to verify individual sentences and concepts through experience? Let's consider an example:

Example 5.1 *If I see, for example, a person from a distance of 300 meters, I do not know whether it is a person or, for example, a cardboard cutout. The fact that a blurry spot of this shape has so far turned out 1000 times to look like a person up close is not an argument that there are no similar cutouts. It is not even "improbable" in the sense that drawing a straight flush from a shuffled deck of cards is improbable. If I go to Disneyland, there may be quite a few cutouts of human figures there, and all my previous experience of not seeing cutouts elsewhere tells me nothing about it. Similarly, the experience of seeing white swans in Europe says nothing about the probabilities of seeing black swans in Australia.*

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[135] Popper, *[The Logic of Scientific Discovery] Logika odkrycia naukowego*, par. 80.

[136] accurate predictions are precisely a special case of high power of the test, in light of the Neyman-Pearson theory, and can similarly be considered in Bayesian theory

[137] Zawistowski, *Order and Contingency*, p. 118

This is because experiential knowledge is based on the interpretation of many interconnected parts of experience. If I have seen an animal in Europe many times, I do not have to see the same one in Australia. If I have seen something in my village, I do not have to see the same thing in Disneyland. If I see a person from afar, then as I approach him, seeing how the shape moves in a characteristic way, and finally seeing up close that he has eyes, skin, a voice, I know it is a person. If he stands still for a long time, I may think that it is a mannequin, and also find out from close up whether this is actually the case. Seeing a painted dome in the Church of St. Ignatius in Rome, I may not be able to distinguish a painted dome from a real dome, but if I look at it from different places, I will know that different images fit the perspective of a flat ceiling, not a round dome.

The same is true in physics, as Einstein pointed out. It is impossible to build a good theory of one experience, but rather a good theory predicts many different phenomena. Newton combined into one the movements of planets, ocean tides, and the movements of heavy objects, and his successors described many other systems. It is also impossible to justify an isolated concept, since even Euclidean geometry, which was an element of all theories until the end of the 19th century, was replaced by another one precisely in Einstein's theory. Similarly, Fisher's error arises, who made the simplest probabilistic model, based on the frequency of a selected aspect of a phenomenon - and proclaimed such a thing objective and scientifically established. Meanwhile, whether in physics or outside it, the model must discover the real causes of phenomena, and outside physics, it is all the more important to make sure that this is actually the case.

The problem with establishing something based solely on frequency can be further illustrated by another example.

Example 5.2 *An innovation of recent years is language models like ChatGPT, Claude, Llama, etc. Such models are fitted (trained) to predict the next word of text based on the preceding words. This process allows the model to be "taught" the ability to meaningfully answer questions and generate articles or stories that look real. However, this is possible only because the model is complex (has billions of parameters) and learns at once a huge number of hidden* *dependencies in text data sets of trillions of words. If we wanted to limit ourselves to models of only word frequencies, we could at most predict the next word based on its frequency in the training set, which would not allow us to produce any meaningful text. For instance: assume that word frequency of word "education" is 1 over 4000, and we use this frequency to model and predict probability of this word. In that case word "education" would be equally unlikely to occur in a sentence: "It is important for kids to go to school to get education" as it is in "Every morning I drink a warm cup of education" or any nonsensical statement, which is absurd.*

Obviously simple model fails to grasp any relevant patterns of language, while ChatGPT models many such relations. And adopting such simplistic models is the key error of the positivists and Fisher. Let's consider a simple probability model, called frequentist probability, according to the axioms defined by von Mises'.

- Assume a binary trial with a result of 1 or 0 (like a coin toss, etc.).
- (Axiom of convergence) As the number of trials continuously increases, the average frequency approaches a limit, and this limit is called probability[138].
- (Axiom of randomness) Successive trials are independent; one cannot predict the next trial based on the previous ones.

Assuming such axioms we can prove the law of large numbers, stating that average frequency will converge to limit with known error bounds, as long as the axioms are met. This is example of such very simplified probability model, which describes the process by the frequency of an event, ignoring other knowledge about it. It may be suitable for games of chance such as roulette. However, it is not suitable for describing a complex, changing world, as positivists would like.

The goal of induction, therefore, is strictly analogous. According to Hans Reichenbach's opinion, can be formulated as meeting the above-mentioned axiom axiom of convergence[139]:

[138]The limit in the sense of Cauchy: flipping a fair coin, I can give an arbitrarily small number $\epsilon = 0.00001$ - and the frequency of heads will sooner or later be in the range $0.5 \pm \epsilon$, if only I flip long enough.

[139]Henderson, "The Problem of Induction", s. 5.3

> to find series of events whose frequency of occurrence converges towards a limit...

And induction, in his opinion, can be justified in a pragmatic way, in this way[140]:

> It is possible that the world is so disorderly that we cannot construct series with any limits. In that case, neither the inductive principle, nor any other method will succeed. But, he argues, if there is a limit, by following the inductive principle we will eventually find it.

These words were written in 1938, when, thanks to Popper, it was no longer possible to ignore the problem of justifying induction. But to such an attempt to escape this problem, one must answer: "Hold on, sir! So you introduced this principle only to tell us now that it will work when the world is ordered, and it won't work otherwise? And how do you know, that the world is ordered, in this particular case? Do you know it in advance, or only when you have built the whole theory?"

Thus, it follows that *there is no criterion for verifying individual sentences.* Only the whole theory is testable by experience (provided that it describes the real order of the world), and not individual sentences and concepts. The latter, on the other hand, acquire meaning along with the whole theory, and are by no means considered meaningless in advance, nor are they refuted with the refuted theory. Thus, the positivists, cornered, resort to what they themselves wanted to expose with "logical analyses".

For the sake of order, it is worth mentioning earlier attempts to justify the principle of induction, which were by no means better. One of the solutions proposed by Wittgenstein or Schlick[141] is an attempt to expose the problem of induction as a meaningless pseudo-problem. Schlick wrote: "Following Hume, we have stated that this kind of logical justification does not exist: it simply cannot exist because these [universal] sentences are not genuine sentences". Such a view implies, that "nonsense" is not only traditional philosophy, as they would like to establish, but also the

[140] ibid., s. 5.3

[141] Popper, *Logika Odkrycia Naukowego*, p. 31

exact sciences, which is similar to the thesis which, already in the 1960s, would find a dedicated group of supporters, with Thomas Kuhn at the forefront.

Such a grand finale allows us to neatly summarize the entire history of positivism, because comparing either Bacon to Newton [142], or D'Alembert and Voltaire[143] to Euler, Maupertuis, and Clairaut[144], or finally Comte and Mill to Cauchy, Galvani, and Ampere[145] will give us exactly the same conclusion. "Scientific philosophy," only in name, had little respect for exact sciences. It only tried to harness them to its ideological wars (most often aimed at Catholicism and Christianity), and as a carte blanche to rule the world. It did not matter at all how much damage it would do to science itself (and it did a lot) and how erroneous are the claims it makes against it. After the 1940s, the mask fell off completely, with the new revelation, that physics is a construct of crowd psychology, without any real truths at all.

This is probably also why the aforementioned Carnap was a strong opponent of Popper, refusing to support him in finding work and a publisher[146], but not Kuhn. Popper, by soberly demanding significant predictions to recognize scientific proof, and then publishing anti-totalitarian polemics, first unintentionally disarmed militant atheism, and then tore off the sheep's clothing from the wolf hunger of the left to repair the world by force and coercion. At the same time, Carnap favorably received Kuhn's book, and invented similar theories about incommensurability[147], which is a key Kuhnian concept.

[142] Zawistowski, *Order and Contingency*, p. 85

[143] ibid., p. 95

[144] ibid., p. 91, 98

[145] ibid., p. 93, s. 107

[146] Notturno, *Popper's Critique of Scientific Socialism, or Carnap and His Co-Workers*

[147] Irzik and Grünberg, "Carnap and Kuhn: Arch Enemies or Close Allies?"

6 Physics Presented as a Construct of Mob Psychology (Kuhn and Others)

6.1 Motives for Undermining Scientific Progress

In the age so universally addicted to technology, liberal philosophers have assured the world in the name of philosophy that physical truth is a construct of mob psychology, and scientific truth exists precisely within such a construct. This is the theory of Thomas Kuhn, published in 1962 in the book "The Structure of Scientific Revolutions," and of his numerous followers, who today play first fiddle among the Western leftist intelligentsia. Competing theories, Kuhn claims, cannot be compared objectively, because the replacement of a theory is the replacement of the entire way of looking at the world, the so-called paradigm. The concept found its place in our language, and supporters of such theories at Western universities have since managed to come up with many crazy theses, generally revolving around the contempt for Western civilization, the dismantling of natural social orders, and a thorough redefinition of philosophical concepts.

For physics part, the problem with Kuhn's theory is fairly simple and has been addressed for the last 100 pages of this book. Let's consider an example. Technical devices operate according to a set design, which contains calculations in light of known laws of physics, how a given device should work, or, in other words, how factors are globally ordered with respect to the result. A light bulb consists of a glass bulb and a filament (wire) made of tungsten. The wire parameters (thickness and consequently resistance) guarantee that when a fixed voltage (such as 24V) is applied, the wire heats up to about 4000K[148], which allows the bulb to shine with a yellow-white light. Moreover, the bulb is filled with nitrogen or argon, which prevents the filament from being quickly destroyed by oxidation. The light bulb works because the Ohm's law of resistance and Planck's law of radiation are unchanging and always precisely fulfilled, and moreover, in light of these and other laws, the parameters of the device have been appropriately adjusted. It is impossible to claim that the knowledge of how to make such a light

[148] 4273 degrees Celsius

bulb is a social construct. It is objective knowledge that we possess, and our ancestors 500 years ago did not possess it. Nor is it possible to claim that physics does not discover truth, at least in the sense in which we understand the word in everyday life, in which a stone that we can see or touch is called real when its properties become predictable to us. The same applies to basic research as well. If a physicist says, for example, that gold is composed of a large grid of atoms, he is in fact relying on a set of predictive interpretations of the world's order. Chemical reactions suggest that gold cannot be broken down into elements and reacts with very few components, being different from other metals. X-ray diffraction allows guessing the crystal structure in which atoms are arranged. Guided by this observation, we can refute Kuhn's claims, but first let's add some context.

First, we see that at the core of the above errors is again the omission of the ordering of phenomena with respect to future effects, that is, final causes. Secondly: Kuhn represents some approach to the history of physics and is even sometimes called a distinguished historian of science. At the same time, the history of physics can be read by tracing the study of final causes. This is precisely what Pierre Duhem did over 100 years ago and discovered that, however incomprehensible and however refuted ancient physical theories may be, they contain a part that is not refuted, growing in an incremental way. The new theory inherits the entire valuable legacy of ordering according to measured quantities and experimental results of the old theory, which often turn out to be a special case of the new theory. For example: Ptolemy's equant[149] anticipated Kepler's second law, and Kepler's orbits are a special case of Newton's law, in the approximation that considers only the mass of the Sun. Le Verrier, Laplace, and Clairaut then provided orbital solutions that take into account the gravity of the planets, which Einstein then used to justify his theory of gravity, calculating the magnitude of the precession of Mercury's perihelion. Thus, a better and better model of planetary movements was built. At the same time, old explanations of orbital motion were refuted: crys-

[149]Equant is geometric construction that Ptolemy used to account for ueven motions of the planets. They are faster when closer to the Sun and they are slower further from it. Equant is eccentric orbital point directly opposite to the Sun: with respect to this point the planet has fixed angular velocity

talline spheres and great cosmic vortices, which Descartes taught.

Hence Duhem's thesis about the origin of physics in scholastic theology: the Aristotelians were right to investigate the global ordering with respect to the effects, but the problem with their system was its building material. Building material based on what every human being is able to consider meaningful and effective to this day, for example, in physiology. The contribution of the scholastics is the modern theory of final causes in physics. A world ordered universally and unchangingly according to the relations of measured quantities and a strong assumption of the contingency of the world, where any non-contradictory system of laws can be true if it is consistent with experience, and any system consistent with experience can be modified and replaced in many ways. This contribution is so important that in the history of physics it becomes a key of meaning, allowing us to separate what is essential and established from what is fleeting and subject to refutation. It follows that Duhem's discoveries cannot be dismissed just like that: opponents, wanting to erase them or ignore them, end up in such trouble that only the most desperate measures can save their cause, thus becoming heralds of the truths they were supposed to fight against.

Therefore, this is the lineage of Kuhn and his thesis, as Fr. Stanley Jaki pointed out[150]:

> Such was the background of the major twist in the historiography of science in this century Sparked by A. Koyre's Galilean studies, first published in 1939-40, it became the "received view" in the 1950s as a large number of historians and scientists turned to the historiography of science. What Koyre did — largely by borrowing from Bachelard the application of "genetic mutation" to intellectual history — was to claim that a "mutational" change separates medieval science (discovered by Duhem) from Galilean and modern science or physics. Koyre's possibly anti-Christian or anti-Catholic motivation (of which more later) in writing his Galilean studies could hardly displease most of those newly emerging historians of science. Nor were they

[150] Jaki, *[The Savior of Science] Zbawca Nauki*, p. 20

> adversely tuned toward Koyre's casting at least one important phase of the history of science into a Darwinian framework. Such an approach to scientific history soon became a runaway fashion among them.

Thus, Koyré, wanting to get rid of the scholastic origin of physics, had to take the thickest barrel possible, undermining the rationality of scientific progress in general. The second significant influence is Darwinism. Of course, (ibid.) "Darwin and professional Darwinists never spoke of revolutions and paradigm shifts that became the shibboleths of the new unwisdom about scientific progress." but it is not difficult to see an indirect influence, in a situation where in the age of Maxwell, Faraday, and Cauchy, Darwinists established that man is not very different from monkeys, and his intellectual abilities are of a similar kind to those of a monkey[151]. Indeed, it has given Darwin himself a lot of epistemological pessimism. In one of his private letters he wrote[152]:

> But then with me the horrid doubt always arises whether the convictions of man's mind, which has been developed from the mind of the lower animals, are of any value or at all trustworthy. Would any one trust in the convictions of a monkey's mind, if there are any convictions in such a mind?

This skepticism can be overcome by pointing out that some creations of the human mind work, allowing us to calculate predictions of phenomena that we could not guess in any other way. Comparing the human mind to the mind of a monkey might not have gained recognition in times of intoxication with scientific optimism. Darwin helped to get out of this situation by claiming[153] that it is rather part of humanity that is closer to animals, and part less so. So maybe Newton is not at the level of a dog, but things are different[154] with "the wife of a degraded Australian savage, who uses few abstract words and cannot count above four." Such arguments gained recognition among racists, eugenicists, and warmongers, but

[151] Bethell, *Darwin's House of Cards*, ch. 18
[152] Letter to William Graham, July 3, 1881
[153] Bethell, *Darwin's House of Cards*, ch. 18
[154] Darwin, *The Descent of Man*, p. 57

they lost their significance after 1945 (which in turn made room for activists for radical ecologism, who despise the human race[155]).

Let's return to Kuhn's paradigms, however. They are similar to Koyré's intellectual mutation, there is a certain irrational intellectual transformation. In 15th century Aristotelian physics was completely sensible and rational, and Copernicus model was fundamentally wrong, 100 years later it is suddenly exactly the opposite, and it is impossible to explain this otherwise than by some psychological changes. In this tone exactly that Koyré begins his book[156], attributing change of intellectual climate to "a decisive mutation", which explains why *the discovery of things that seem childishly simple to us required such prolonged efforts.*

The question is, what is childishly simple? Modern physics? Well, not really. Isaac Newton had to provide a series of proofs that his theory worked, including derivation of Kepler's orbital trajectories from the laws of dynamics and gravity, using geometric demonstrations[157]. In the meantime, such a theory is not very useful for describing most movements on Earth, since these movements are subject to significant resistance, e.g., from air. This is important, if we recall the situation, which Kuhn repeatedly mentions, reflecting how he first discovered [158] the incommensurability of theories, allegedly struggling with the seemingly nonsensical phrases of Aristotle's physics. Kuhn said, for example, that [159] Aristotle was not a terrible Newtonian physicist, but "a very good physicist indeed, but of a sort I'd never dreamed possible" and this was his main inspiration for introducing incommensurability.

The problem is that Aristotle's physics does not provide sup-

[155]Bethell, *Darwin's House of Cards*, p. 220

[156]Koyre, *The Galileo Studies*, p. 3

[157]This apparatus of Newton undermines related opinion that the key scientific innovation of the 17th century was the use of symbolic equations, since the geometric calculus of physical quantities dates back to the 14th century from Oresme and other scholastics. To completely refute this opinion, it is enough to refer to Cauchy (Zawistowski, *Differential Calculus made clear (by its original inventor): Cauchy's theory of infinitesimals*), and indicate that until the 19th century there was no coherent theoretical foundation for algebraic notation in differential calculus.

[158]Oberheim and Hoyningen-Huene, "The Incommensurability of Scientific Theories"

[159]Jarnicki and Greif, "The 'Aristotle Experience' Revisited: Thomas Kuhn Meets Ludwik Fleck on the Road to Structure"

port for the existence of irrational paradigms, because it can be logically understood, as physicist Rovelli recently pointed out [160]. Aristotle built a very well-established theory, and the main misunderstandings seem to stem from the fact that this theory is not analogous to Newton's theory, but to few other modern theories. Aristotle's physics includes the dynamics of motion with drag, as well as elements of thermodynamics and chemistry (melting, evaporation, burning). Consider example: do light objects really fall as fast as heavy objects, according to Newton, and against Aristotle opinion? Why don't you try it yourself, Rovelli writes, throw a feather and a stone and see if they fall at the same speed. If we take away the air, then maybe so, but Aristotle studied real motion in the real world, where water and air exists.

6.2 Refutation of Kuhn in the History of Physics

After this introduction, we can proceed to read "The Structure of Scientific Revolutions"[161] and, by pointing to the final cause, demonstrate that Kuhn's conclusions are false, as far as they concern scientific progress and the history of physics. Here are the main errors:

- Kuhn falsely claims that the language of physics is the same as everyday language and that it arises unconsciously.
- Kuhn falsely claims that theoretical interpretation in physics is a psychological phenomenon.
- Kuhn falsely claims that two physical theories describing the same experience cannot be compared objectively when one is wrong and the other is right.
- Kuhn does not distinguish between anomalies within a theory (where the result of an experiment is contrary to the theory) and a result that cannot be calculated (because, for example, initial conditions cannot be determined).

[160] Zawistowski, *Order and Contingency*, p. 36
[161] Kuhn, *Structure of Scientific Revolutions: 50th Anniversary Edition*

We have already mentioned that the concepts of physics (such as atom, oxygen, momentum, and others) are embedded in the ordering of experiences with respect to predictable effects and are therefore meaningful. Physical concepts acquire meaning ”because experience becomes understandable,” as Einstein wrote. We also said on p. 62 that Kuhn ignores this, saying that the language of physics arises in the same way as everyday language, and getting apparent evidence that physicists do not use language in a rational way. Scientists in the time of Copernicus (ibid., p. 128)

> Instead, they were changing the meaning of ‘planet’ so that it could continue to make useful distinctions in a world where all celestial bodies, not just the sun, were seen differently from the way they had been seen before.

For Kuhn, the fact that physical theory changes means that the world also changes, which one commentator called ”Kant on wheels.” Kuhn, what common sense describes as objective reality, considers to be a psychological effect - and a change in the prevailing theory changes this ”reality”[162]. If we notice this view, with which leftist sages have long been mesmerized (and which is quite suspicious to engineers, Thomists, and common-sense peasants), then everything else becomes simple. A planet is a luminous, moving point in the sky, whose trajectory was described by models, and which was interpreted as a certain material body (animate or not, composed of celestial ether or even ordinary matter - but for the description of ordering, it doesn’t matter). Kuhn further (ibid.) insists that physical concepts are ”seen”.

> To see oxygen instead of dephlogisticated air, the condenser instead of the Leyden jar, or the pendulum instead of constrained fall...

No scientist perceives oxygen, because oxygen is not visible. Oxygen and phlogiston in the 18th century were postulated on the basis of two theories of combustion, only these theories were tested by experience (e.g., whether burned iron loses mass or increases it). The inventors of the Leyden jar, Musschenbroek and Kleist, did not

[162]Lipton, “Kant on Wheels”

understand what a "capacitor" was in the textbook sense, because there was no electrical theory at that time. Nevertheless, they understood the device as physicists, because they also managed to investigate the principles of operation of the device (charging it, connecting it in batteries), which was precisely a rather rudimentary theoretical interpretation and an ancestor of current interpretations, on the basis of which electrical theory was built. Kuhn continues as follow (ibid. p. 129)

> was only one part of an integrated shift in the scientist's vision of a great many related chemical, electrical, or dynamical phenomena. Paradigms determine large areas of experience at the same time. It is, however, only after experience has been thus determined that the search for an operational definition or a pure observation language can begin.

Duhem also emphasized that theory describes vast areas at once. But this cannot be a matter of psychology, or "seeing," because you see one thing in front of you, not many different things, especially those that you know only indirectly from the writings of other scientists. These different phenomena are not "seen," but reasonably interpreted on the basis of theory. The key is the perverse use of the word "see." I can say "I see my friend," because, for example, I recognized his face, but this seeing has little to do with the grounds to consider him a friend, or the definition of a friend (is rather interpretation of facts, that I have known him for a long time, we help each other, we talk, etc. - and I know based on my senses that the same person is standing in front of me). I would see his double exactly the same way, but he would not be him.

Similarly, physics relies on seeing to a minimal extent. If, for example, we want to describe the movement of Halley's comet, like Clairaut in the 18th century, we must, based on the initial conditions (i.e., historical observations), calculate the equation of motion and provide measurable predictions. If the predictions are accurate, we know that we have properly explained the given system. In this way, abstract theory grows organically through the work of physicists, becoming more and more refined and describing an increasingly wider range of reality. The second sentence of

Kuhn means the same as 'However, only when A occurs, can we begin to build what is necessary for A' - because: "experience is determined" by "operational definitions" how to measure things, not differently. There is no obstacle build the definitions of quantities before they are used for anything. First of all, they are conventions one can freely adopt or change. Secondly, rational construction of physical quantities was indeed performed by scholastics, as I have outlined on p. 108.

6.2.1 Opinions of Kuhn on the Impossibility of Objective Observations

The above discussion is related to another misrepresentation. Kuhn insists that it is impossible to see anything objectively. He gives as an example the well-known rabbit-duck illusion (which is borrowed from Wittgenstein's "Philosophical Investigations"). We will paste this illusion here, published in the 19th century in the satirical magazine Fliegende Blätter (Figure 6.2.1). Focusing on the rabbit's ears on the left, we will see a duck's beak. Looking at the outline of the duck's head on the right, we will see a rabbit's head in it. Kuhn writes about this (p. 126):

> The duck-rabbit shows that two men with the same retinal impressions can see different things; the inverting lenses show that two men with different retinal impressions can see the same thing. Psychology supplies a great deal of other evidence to the same effect...

The senses can, of course, be mistaken in such a deliberately prepared case, as well as in a few others. However, this does not mean that someone has mistaken a real duck for a real rabbit, or a tuning fork for a pendulum (as Kuhn further believes).

> ...and the doubts that derive from it are readily reinforced by the history of attempts to exhibit an actual language of observation. No current attempt to achieve that end has yet come close to a generally applicable language of pure percepts.

Yes, a "generally applicable language" has not been built, and therefore the method of physics is used in physics, and not "gen-

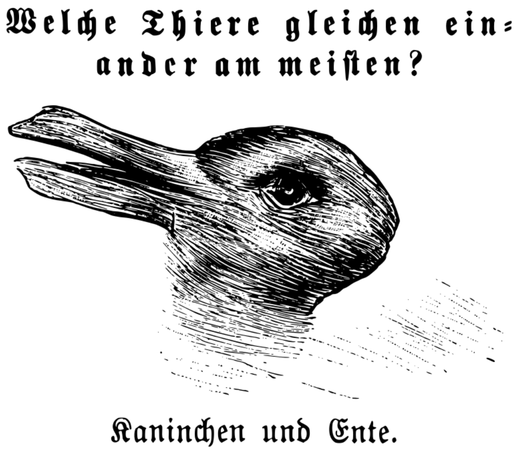

Figure 1: Duck-rabbit from Fliegende Blätter.

erally." Indeed, attempts to create such a universal language by neopositivists have been unsuccessful (p. 126)

> And those attempts that come closest share one characteristic that strongly reinforces several of this essay's main theses.

Incidentally, positivists support irrationalists with their arguments, but this is only because they are two sides of the same coin. At the same time, both can be refuted by admitting that the images corresponding to physical concepts are not accurate or true, but also that the relationships between measured quantities show the true order of the world, described by the precise language of mathematics and experimental, operational definitions. Other efforts of Kuhn will convince us even more that this is the right solution. Further, he invokes Duhem's thesis (p. 126), distorting it in a way typical to other followers of psychologism:

> But their result is a language that—like those employed in the sciences—embodies a host of expectations about nature and fails to function the moment these expectations are violated

Two things are important here. Yes, the language of explanations based on a theory is sometimes modified when previous predictions do not work. Moreover, in such a situation, it is not clear what has been refuted (Duhem's Problem[163]). However, this results from practical problems that can be solved by further iterations of experiments and theory construction. At the same time, the language of explanations of how to make a measurement does not undergo any modification, referring to real objects and operations. Kuhn writes about "observational language," while removing the key distinction between describing how to measure something and descriptions of the theory itself. The former is precise, but the latter does not have to be fixed. The former is necessary, the latter is not (because physical theory is a description of the order between measured quantities). Kuhn ignores this, which is revealed in various unclear statements. How could scientists see oxygen instead of dephlogisticated air, since oxygen is transparent? Obviously, it could not. Lavoisier measured that some burned substances increase in mass, and metal ores weigh more than metals. Priestley discovered that mercury ore, when heated, releases a gas that accelerates the combustion process, etc. Based on the interpretation of these facts, it was reasonable to postulate an invisible, massive component of oxidation and combustion processes.

Neither a capacitor is something we perceive or see. A capacitor is a rational abstraction, based on the density of electric charge in a conductive body, subject to the phenomenon of electrical induction (electric charges move through a conductor in an electric field and mutual electric attraction between two conductors allows to conserve energy). As a result, insulated cables, human fingers, and clouds do not look like a capacitor at all, but they exhibit electrical capacitance (a property of a capacitor). The capacitance of a finger is the basis of the operation of touch screens, and the capacitance of cables is an important issue in the transmission of energy and signals. On the other hand, a capacitor from a store may not differ in appearance from a resistor or a diode - it will be a cylinder or a rectangular box with two electrical connections. If a breakdown occurs between the layers of the conductor in such a capacitor, it loses its electrical capacitance - and thus in practice ceases to be a

[163] Ariew, "The Duhem Thesis"

capacitor. It is clear that a capacitor is an interpretation based on theory. Dealing with such problems is unrealistic: a scientist or engineer does not think at all about what a capacitor looks like, but measures and calculates capacitance, or wonders whether a given structure will have a significant electrical capacitance. And it is not the capacitor that replaced the Leyden bottle, but the theory of electricity that assimilated simpler cases of the description of electricity, giving an example of incremental growth of knowledge.

The same can also easily be shown in the case of a pendulum, because a pendulum is a theoretical interpretation based on mechanics, referring to a mass moving in periodic motion, and not something we "see." Hence, pendulums are not only masses on a string, but also spring pendulums, torsional pendulums, or Huygens' cycloidal pendulums, or gridiron pendulums that compensate for thermal expansion. The mass on the string itself does not have to have the property of periodic motion, i.e., the period of deflection of the pendulum does not have to be constant and described by the equation $T = 2\pi\sqrt{\frac{l}{g}}$. It is constant only when the deflection of the mass is small and the resistance to motion is negligible. Otherwise, the motion of the mass on the string is not periodic. A pendulum also does not work under water (due to large damping) and does not work when we swing it too much - it is not then a system with periodic motion. Discovering this desired property of the pendulum therefore assumed choosing such circumstances and parameters in which these desired properties occur: it is therefore a rational invention, not psychological-perceptual transformations. Kuhn[164], for reasons known to himself, attributes to the observation of the pendulum a perceptual transformation (similar to Koyré's mutation), on which Galileo based "many of the most important parts of his dynamics."

As for indicating the point at which this psychological transformation occurred, Kuhn has a problem, because if, for example, Buridan described something, it means that Buridan *saw* it, and if he saw it, it means that the scientific revolution was earlier than in the 16th century:

> ...(Galileo) was trained to analyse motions in terms

[164] Kuhn, *Structure of Scientific Revolutions: 50th Anniversary Edition*, p. 121

> of the theory of impetus... a late medieval paradigm (...) Jean Buridan and Nicole Oresme, the fourteenth-century scholastics who brought the impetus theory to its most perfect formulations, are the first men known to have seen in oscillatory motions any part of what Galileo saw there. Buridan describes the motion of a vibrating string as one in which impetus is first implanted when the string is struck; the impetus is next consumed in displacing the string against the resistance of its tension; tension then carries the string back, implanting increasing impetus until the mid-point of motion is reached; after that the impetus displaces the string in the opposite direction, again against the string's tension, and so on in a symmetric process that may continue indefinitely. Later in the century Oresme sketched a similar analysis of the swinging stone in what now appears as the first discussion of a pendulum.

Buridan, incidentally, is not a thinker distant from other scholastics, at all. A rudimentary concept of the quantity of motion was given in the 6th century by John Philoponus[165], and the scholastics knew about it, but did not consider it correct, until other developments happened. Only at the turn of the 13th and 14th centuries was Aristotelianism sufficiently remodeled to take the next step. Hence, supporters of mutation find themselves between a rock and a hard place. How come then impetus can be a paradigm and how it can be a matter of *seeing*? It's difficult to erase Buridan and Oresme, because Galileo's school repeats the same arguments. It's also not good to acknowledge them, because they are scholastics. Kuhn strategy here, however, is to ignore obvious rational and incremental developments and repeat usual non-sequitur mantra, that everything everywhere is gestalt switch and mob psychology.

6.2.2 Can We Compare Physical Theories?

According to Kuhn, the Special Theory of Relativity (STR) cannot be compared with Newton's dynamics, although they give different results for the same experiments. I intend to show that this is

[165] Zawistowski, *Order and Contingency*, p. 44

wrong. In light of final causes, the classical limit of STR and Newton's theory can be considered the same; the new theory takes over from the old theory the "valuable legacy" of the description of ordering and the experiments that were performed testing Newton's theory. Kuhn disagrees with this[166]:

> Apparently Newtonian dynamics has been derived from Einsteinian, subject to a few limiting conditions. Yet the derivation is spurious, at least to this point. Though the N1's are a special case of the laws of relativistic mechanics, they are not Newton's Laws. Or at least they are not unless those laws are reinterpreted in a way that would have been impossible until after Einstein's work. The variables and parameters that in the Einsteinian E1's represented spatial position, time, mass, etc., still occur in the N1's; and they there still represent Einsteinian space, time, and mass. But the physical referents of these Einsteinian concepts are by no means identical with those of the Newtonian concepts that bear the same name. (Newtonian mass is conserved; Einsteinian is convertible with energy. Only at low relative velocities may the two be measured in the same way, and even then they must not be conceived to be the same.) Unless we change the definitions of the variables in the N1's, the statements we have derived are not Newtonian. If we do change them, we cannot properly be said to have derived Newton's Laws, at least not in any sense of "derive" now generally recognized.

Above, Kuhn considers the classical limit of the Special Theory of Relativity (STR), but fails to do it well. The classical limit is the approximation of the laws of STR in the limit $c \to \infty$ (which can be practically read as c being very large compared to other quantities). Instead, Kuhn gives the classical limit as "additional theorems such as $(v/c)^2 << 1$", without mentioning explicitly that in all equations of STR, also e.g. the one for relativistic kinetic

[166]Kuhn, *Structure of Scientific Revolutions: 50th Anniversary Edition*, p. 100

energy:

$$E = mc^2 \left(\frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} - 1 \right)$$

it is also necessary to go to the classical limit (and $(v/c)^2 << 1$ alone is not enough). Hence, the erroneous argument seems to follow that masses are not identical because Einstein's mass is equivalent to energy. This is not true when, in the classical limit the kinetic energy becomes to $\frac{mv^2}{2}$, and all other transformations of energy-momentum and other spacetime vectors become equivalent to the classical ones. Therefore, in the range of applicability of classical physics, Einstein's concept of mass-energy equivalence is generally undetectable for us. We can detect the difference in particle accelerators and in nuclear physics reactions.

To refute Kuhn's objection that STR has a different mass and different physical quantities, let's first say what "mass" is in the sense of classical mechanics. It uses two concepts of mass: gravitational mass and inertial mass. Gravitational mass refers to the law of universal gravitation (where $\vec{F}$ is the force acting on a body with (gravitational) mass m attracted by another body with (gravitational) mass M and at a distance r.

$$\vec{F} = \frac{GMm}{r^2}\hat{r}. \tag{1}$$

For bodies on the surface of the Earth, (1) reduces to $\vec{F} = m\vec{g}$, where $g = 10\frac{\mathrm{m}}{\mathrm{s}^2}$. Inertial mass appears in Newton's second law of dynamics: if a force F acts on a body with (inertial) mass m, it moves with an acceleration $\vec{a} = \frac{\vec{F}}{m}$. Gravitational mass is a coefficient (number) determining to what extent bodies are subject to the force of gravity, and inertial mass is the ratio (number) of force to acceleration. It is a postulate of the theory (tested many times) that gravitational mass is equal to inertial mass. The same, without any changes, also applies to the classical limit of Einstein's Special Theory of Relativity. On the basis of the Special Theory of Relativity, another law $E = mc^2$ is similarly introduced, and the hypothesis that what is actually inertial mass is also exchangeable for energy: e.g., spent nuclear fuel will be lighter. The change in mass Δm is expressed by the change in energy as $\frac{\Delta E}{c^2}$. Going to the classical limit $c \rightarrow \infty$ we get $\Delta m = 0$, which is generally a good approximation: e.g., burning coal or gasoline does not lead to a change in the mass of the reaction products, according to the chemical law of conservation of mass.

How do we determine the "physical equivalents" of mass? By measuring mass, through the application of theory. For example: by measuring the trajectory using a measuring tape and a stopwatch, as well as the force with which the body is accelerated (e.g., using a spring). Physicists can measure both the quantities of system E_1 (STR in the classical limit) and system N_1 (Newton's dynamics) in the same way, which allows us to prove that Newton's dynamics breaks down for large velocities. One can, for example, accelerate ions with different mass-to-charge ratios using an electric field. Initially, light ions will accelerate much faster than heavy ions — but further increasing the energy will never allow us to obtain a speed greater than $c = 3 * 10^8 \frac{\mathrm{m}}{\mathrm{s}}$. Moreover, the ions hitting the detector will have much more energy than kinetic energy calculated from their speed in the sense of Newton's theory. By repeating a few similar experiments (e.g., measuring time dilation), we can make sure that STR fits the results better than Newton's physics.

Newton's theory also considers two different concepts of mass. So if the difference between the mass of system E_1 (STR in the classical limit) and the mass N_1 (Newton's dynamics) is a significant problem, then a bigger problem should already exist within Newton's theory. Accepting Kuhn's hypothesis can therefore lead us to two things. Either to absurdities like that many paradigms already existed in Newton's head, who suffered from some kind of split personality. Or to the conclusion that this "paradigm shift" is not relevant to the described case. Einstein's mass is "exchangeable for mass," yes. So what? Just as Newton connected inertial and gravitational mass through hypothesis and experiment, so too can we additionally consider the equivalence of mass and energy. And this does not invalidate earlier conclusions about equivalence of mass in terms of inertia and gravity (they are, after all, explicitly present in the improved version in General Relativity, as Einstein's equivalence principle).

Moreover, classical mechanics can be formulated using the Euler-Lagrange equation, without reference to Newton's laws of dynamics. One can solve a mechanical system by determining the kinetic energy T and the potential energy U, calculating the Lagrangian $L = T - U$, and obtaining the equations resulting from the principle of least action and the Euler-Lagrange equation:

$$\frac{\partial L}{\partial x} = \frac{d}{dt}\frac{\partial L}{\partial \dot{x}} \tag{2}$$

For example, for free fall in a uniform gravitational field, the Lagrangian is $L = \frac{1}{2}m\dot{x}^2 + mgx$ (g — gravitational acceleration, x — position, $\dot{x}$ — velocity, i.e., the first derivative of x with respect to time), so calculating equation (2) reproduces the well-known law of universal gravitation in a uniform gravitational field $\ddot{x} = g$, that the acceleration $\ddot{x}$ is constant and equal to $g = 10\frac{\mathrm{m}}{\mathrm{s}^2}$. Here it is not at all clear where the "physical referents" of Newton's mass have gone. Newton's laws of dynamics and gravitation have been replaced by energy formulations and an additional axiom: the principle of least action — and this axiom is not equivalent to Newton's laws (I can apply this principle equally well to optics, electrodynamics, or STR). Despite this, there was no "paradigm shift": for 150 years physicists have simply used both formulations of mechanics, and the variational principle is the foundation of various other modern theories.

6.2.3 Lack of Distinction Between Anomalies in Physics and Duhem's Problem.

In order to demonstrate that anomalies are sometimes arbitrarily ignored for a long time, Kuhn gives the following example (Kuhn, *Structure of Scientific Revolutions: 50th Anniversary Edition*, p. 80):

> Even in cases where no mere [computational] mistake seems quite possible (perhaps because the mathematics involved is simpler or of a familiar and elsewhere successful sort), persistent and recognized anomaly does not always induce crisis. No one seriously questioned Newtonian theory because of the long-recognized discrepancies between predictions from that theory and both the speed of sound and the motion of Mercury. The first discrepancy was ultimately and

> quite unexpectedly resolved by experiments on heat undertaken for a very different purpose; the second vanished with the general theory of relativity after a crisis that it had had no role in creating.

I believe that these cases are not anomalies of Newton's theory at all, but rather another misunderstanding or misrepresentation of Duhem's problem by irrationalists, that when there is a conflict between theoretical predictions and experiment, it may not be immediately clear what has actually been refuted.

It is not true that there was a long-standing discrepancy between the precession of Mercury's motion and Newton's theory. It is necessary to distinguish the theory itself (of gravity and dynamics) and its application to a certain real system. The latter requires this system (mass distribution, etc.) to be known in advance. We can accurately measure the mass distribution on Earth, but we can only learn about the masses in the Solar System indirectly, through observations of visible objects. Dark planetoids, dust and gases often cannot be seen; and visible objects cannot be weighted. How much they weigh, and whether there are any other objects, we can determine only when our entire machinery of hypotheses and assumptions allows us to get accurate predictions. In this way LeVerrier in 1846 discovered the existence of Neptune, postulating an additional planet whose influence changed the orbit of Uranus, and similarly Clairaut calculated the trajectory of Halley's comet.

LeVerrier also discovered a small anomaly in the motion of Mercury, which he tried to explain also by postulating another celestial body, a hypothetical planet very close to the Sun and then called Vulcan. The search for Vulcan continued long after his death — until the early 20th century, and was based on rational experiments. Vulcan, if it was close enough to the Sun and reflected light poorly, might not be directly visible. So astronomers began to look for transits across the solar disk (i.e., when the planet is seen as a small dark dot on the Sun), as well as observations during total solar eclipses, which are very rare. Vulcan was supposedly seen many times, but astronomers were unable to determine its orbit and predict new trajectories.

Even shortly before Einstein's publication, when belief in the existence of Vulcan was small, it is difficult to speak of a crisis of

Newton's theory because of Vulcan, because one can do what physicists are currently saying about the anomalous motion of galaxies: postulate the existence of some additional, rare, cold (and therefore impossible to see) matter. Le Verrier speculated that this might be the case as early as 1859[167]. Without excluding such explanations it is impossible to demonstrate the refutation of Newton's theory.

Similar situation concerns the speed of sound. Newton gave a calculation of the speed of sound, obtaining a result with an accuracy of about 15%. This result was corrected more than 100 years later, when the thermodynamics of gases — a field that existed in a primitive form in the 17th century — was better understood. Even more than in the case of Le Verrier, scientists were limited by ignorance and had to make auxiliary hypotheses that might be true, or not, and be replaced by something better in the future, as thermodynamics progressed. A force acts on a body, says Newton's second law — well, what is a "body"? A gas particle, as a rigid sphere? And how would we know that in the 17th century? And do these spheres have a fixed velocity, or some distribution, and is this distribution constant, or does it change over time? This is the problem for which Newton's calculations are not very accurate: molecules change temperature (and average velocity) under the influence of a sound wave.

Real anomalies appeared with the discovery of the Special Theory of Relativity. Classical theories were forced to include ad hoc corrections to account for experiments testing the existence of the luminiferous aether, the medium in which electromagnetic waves were supposed to propagate. At the same time, the basic mathematical of STR already existed, in the form of a transformation that preserved the invariant laws of electrodynamics in moving frames of reference. In the case of the precession of Mercury and the speed of sound, the revision of the theory did not occur, because auxiliary hypotheses could be modified to account for the result. Therefore, Kuhn wrongly points to these examples as anomalies of Newton's theory.

[167] LeVerrier, *"Letter from Mr Le Verrier to Mr Faye on the theory of Mercury and on the movement of the perihelion of this planet"*

6.3 Fleck, Feyerabend, Alan Sokal, and the Impotence of Left-Wing Rationalism in the Face of Irrationalists.

There is discussion [168] whether Kuhn's theories are truly his original work, or whether he may have taken them from Ludwik Fleck, who published similar ones earlier. This means, incidentally, that we can easily find in him errors similar to those of Kuhn. Ludwik Fleck was a physician and microbiologist, that is, he dealt with a field dealing with complex systems, in which the results of observations are largely based on the perception of the researcher. For example, it is possible that if a researcher observed a rare microbe under a microscope and described it very carefully, his colleague, reading this description, might imagine something slightly different, or might write a slightly different description while looking at the same sample. The perception and naming of colors, shapes, and various visible accidents may not be the same. Two researchers from different scientific communities or different eras are likely to disagree even more. This seems to be the core of Fleck's theory. The main mistake lies in:

- the generalization of this observation to physics without knowing what physics does
- ignoring that other fields also rely, at least in part, on measurement
- ignoring that our reason and perception is effective enough to predict and understand most of our usual experience.

Fleck writes as follows thus[169]:

> The telescope shows, for example, a ring surrounding Saturn; a man educated in the scientific thought style no longer understands that, in order to recognize the connection between the image seen in the telescope and the distant planet, one must think in this style. Moreover: the very concept of "planet," "image seen

[168] Jarnicki and Greif, "The 'Aristotle Experience' Revisited: Thomas Kuhn Meets Ludwik Fleck on the Road to Structure"

[169] Fleck, "[Problems of theory of knowing] Zagadnienie teorii poznawania"

> in the telescope," "distance," or "connection" already contains this style. Looking into the telescope and seeing this image in it (and not, for example, a reflection of one's own eyelashes) and the disposition to infer from what is seen in this tube about what is "in the sky" are already elements of the scientific thought style. Whoever can look into the telescope and think about Saturn is already using a certain definite thought style. For him there is no other possibility: he must recognize Saturn's ring as a reality independent of himself, and his thought style as the only "good" one. This is the role of the thought style: for its participants there are no two possibilities, between participants in separate styles there is no understanding.

Fleck therefore proclaims the incommensurability of competing scientific theories, similarly to Kuhn. The physicists cannot imagine any other possibility than their current theories, nor compare them objectively with others. I will spare myself the refutation, as the earlier subsections on Kuhn are quite sufficient for that. However, let's discuss his own example to show that there is no inference from what is seen in the tube to what is seen in the sky, but a process of reasonable interpretation of many relevant facts. Whether something is Saturn or not had little to do with what Saturn looks like, at least for most astronomers studying it. Saturn seen with the naked eye looks similar to a bright star. This is due to diffraction occurring in the human eye, which thus has a limited ability to recognize details (accuracy is about 0.017 degrees, or 300 meters at a distance of 1000 km). At the same time, several years of observation will show us that Saturn differs from a distant star —it moves in a different orbit, orbiting the Sun approximately every 30 Earth years. This is where the word "planet" came from, from the Greek "planētai" — that is, wanderers. Having developed a model (like Ptolemy and other Greeks), we can determine that a particular "star" is Saturn, and improving this model was not so much about looking at Saturn more closely, but about measuring angles and time more accurately. This is precisely the experimental progress that Tycho Brahe developed and produced data for the Kepler's research on orbital motion. The telescope appeared in parallel (developed by the Dutchman Lippershey in 1608), and Galileo tried to adapt the invention for astronomy. Unfortunately, the fact that the images of celestial bodies were "blurry, contradictory, and inconsistent with what anyone could discover with the naked eye"[170], combined with the lack of explanation for this problem, hindered the acceptance of Galileo's discoveries by contemporary scientists. For example, astronomer Magini wrote to Kepler that[171] Galileo "achieved nothing, although 20 learned men were present, no one saw the new planets clearly, so it will be difficult for him to maintain that they exist." Equally weak was the evidence for the Earth's motion around the Sun, due to the inability to observe stellar parallax and the Coriolis force, as well as the inexplicable, in the early 17th century, lack of visible mechanical effects of the Earth's motion. Incidentally, Western scholars present the Galileo affair to the public in quite the opposite way, not only demonstrating hostility to the Catholic Church, but also providing ammunition to another scientific irrationalist, namely Paul Feyerabend, who believes that there is no scientific method. An undeniable plus of Paul Feyerabend is that he is at least an advocate of pluralism in science, which contradicts main claims of scientism, the monopoly on saving the world and scientific infallibility.

Let's return to the problem of observation. We gave the case of simple quantities, which the ancient Greeks dealt with, and which is contrary to Fleck's thesis. Even more contrary to his theory are modern physical measurements. It is clear that a physicist and engineer does not measure temperature or pressure with his hand or eye, but rather interprets the height of a mercury column or the voltage of a thermocouple in an appropriate instrument. A chemist does not see oxygen, but he can guess that it exists by measuring and interpreting the pressures and mass ratios of reactions in a sealed system. An astronomer also does not need to rely on seeing colors, when he/she can use, for example, spectroscopy. The yellow-white light of Saturn can be decomposed into spectral lines, and by measuring and interpreting the intensity of the lines, one can recognize the content of hydrogen, helium, and methane in the atmosphere of this distant planet. When we apply spectroscopy to

[170] Feyerabend, *[Against Method] Przeciw Metodzie*, p. 45
[171] ibid., p. 172

distant stars and recognize the same spectra of common substances shifted due to relativistic effects, we can infer distance and mass. In this way, physics has long since risen far above the level of sensory observation.

In all these applications, the element of subjectivity of observation is practically eliminated, since the observation is of a pointer, a lamp, or digits on a screen, which almost everyone is able to objectively distinguish. This does not mean full objectivity or infallibility of scientific measurements, but the problem is theoretical, not perceptual. Measurement improves our perception, but it complicates our thinking, it introduces complexity. The main problem is: when measuring, are we thinking about the right final cause, or are we rather making a systematic error? This observation has an important conclusion, called Duhem's problem. Namely, the entire complex conceptual machinery of physics must be somehow justified, and it becomes justified when we obtain accurate, precise predictions of unknown facts. However, if the predictions do not work, Duhem says, it may not be immediately clear what has been refuted, since the experiment may not work for many reasons. Perhaps (as was the case in the OPERA experiment) one of the thousands of optical links has loosened, one of the thousands of integrated circuits has burned out; and only additional tests and modifications can tell why this happened. However, this has nothing to do with perception and crowd psychology. In academic philosophy, on the other hand, there is the concept of the "Duhem-Quine problem," but it does not have much to do with Duhem. Psychologists have distorted Duhem's problem to claim that[172] "any theory can be accepted in the light of any evidence, as long as we change our other beliefs radically enough," which of course we cannot agree with.

As for Fleck, his polemic with the philosopher Izydora Dąbska is somewhat interesting, as it illustrates both the impotence of left-wing rationalism (like the Lwów–Warsaw school) and the strategies of irrationalists to overthrow this rationalism, bringing (consciously or not) the discussion to a ground unpleasant for it[173]:

[172] Ariew, "The Duhem Thesis"

[173] Fleck, *[About the Article of Ms. I. Dabska in Philosophical Review] W sprawie artykułu p. Izydory Dąmbskiej w Przeglądzie Filozoficznym*

> I cannot accept that "empirical sciences describe ... the world as it appears to people when they are awake, accurately predict, effectively act and interact." Observation, free from traditional, now outdated prejudices, teaches that people of action imagine the world very differently from the views of science. Aviators, sailors, sports record holders, gamblers, political activists, managers of large enterprises, leaders of great nations — they are almost always superstitious people, recognizing, for example, "mascots" [2] and various superstitions such as unlucky days, assigned missions, irrational, mystical beliefs, etc. I doubt whether without this — so coldly — they could act effectively and intensely, and especially cooperate and lead. A practical man recognizes simultaneously a dozen or so theories contradictory in their consequences, as long as they are convenient for him in certain areas. The systematic nature of the construction of scientific theories and their claims to consistent validity everywhere and always — are contrary to the circumstantial and utilitarian nature of the views of people of action. They often value specialists, but do not recognize and disdain the basic belief of scientists that the world can be grasped from a single thought style.

In physics and its entire family of thunderbolt technology, this is obviously false, for reasons already mentioned. Let's focus on other sciences, however. Is an athlete who attributes his successes to divination from fish entrails really no worse than a *good* scientist like the aforementioned "Student" Gossett? Perhaps the athlete is effective in jumping and lifting, but not in making true hypotheses that actually turn out to work. If this were not the case, then professional athletes would not so often use the services of physiologists, doctors, coaches, dieticians, etc.

In particular, the hypothesis about the effectiveness of divination from fish entrails will almost always be characterized by low power $1 - \beta$ and a high probability of Type I error, because it is imprecisely defined, postulates complex and arbitrarily chosen relationships, and is based on a small statistical sample. By proceeding in this way, the athlete will not only believe in false positive results, but also omit many true results in his analyses (due to low power). "Student" also encountered a similar approach when he started working at the brewery, because statistical methods were not used at that time, but only practice and common sense, which are precisely limited in the described way. It is therefore worthwhile to build models of ordering phenomena through incremental, properly designed (e.g., balanced) and statistically significant experiments. This allows for significant progress, also in industry, agriculture, medicine, or biochemistry, and athletes at a sufficiently high level also understand this. As for leaders and strategists, I have already written that a similar theory of nested final causes is given by both Sun Zi and other Chinese sages, as well as by contemporary strategists and intelligence officers. Is this theory, then, important, or is superstition important, about which people do not agree with each other in anything? Which superstition is more effective than others? Or are they all equally good?

Overthrowing these theses therefore presents no problems, except for one. For while it is clear that properly practiced sciences surpass common sense, common sense defends itself quite well against theories of rare prehistoric exceptional events, which can be described by the word "miracle," the hypotheses of some physicists that there are many worlds that cannot be seen or measured, or that reality does not exist, physics has overthrown logic, free will is an illusion, human intellect is no different from that of an ape, and man should be guided by his instincts. The arguments I have given are at the same time directed not only at Fleck, but also at Freud, Darwin, Fisher, Dawkins, positivists, Kantians, and many others like them holders of the insignia of expert knowledge. And Alan Sokal, who in the 1990s organized a provocation aimed at experts on paradigms, sending them a false, nonsensical article about quantum gravity being a social construct, reminds us that nothing has changed in this matter. At the same time, his essay attempting to criticize Feyerabend leaves much to be desired. Sokal's argument for the realism of scientific theories is as follows[174]:

> In reality there are vast domains in physics, chemistry and biology where there is only one known non-

[174] Sokal, *Beyond the Hoax*, p. 251

> crazy theory that accommodates the known facts, and where many alternative theories have been tested and failed because their predictions contradicted the experiments. In these domains it is reasonable to think that our current theories are, at least in an approximate way, true.

Physical theories are neither unique, nor needing argument from uniqueness. There are a few other theories that agree with the predictions of General Relativity: this applies both to other metric tensor theories and to the variable speed of light theory, which Einstein studied in 1912, and which can now be reconciled with the results of GR. GR is widely accepted, primarily thanks to the tests from which it emerged victorious. Similarly, many modifications of quantum field theories are being considered, as there are still unresolved problems. The biggest of them seems to be reconciling GR and quantum theories. We mentioned that classical mechanics has different, non-equivalent formulations, and, more importantly, it is still widely used by physicists and engineers within its range of validity, that is, almost everywhere. Why insist on the *uniqueness* of a physical theory, when this uniqueness does not exist, and even if it did, it would not be decisive as proof? We find the answer a page earlier (p. 250):

> The second, and more fundamental, mistake is to think that our inability to account in general terms for the success of science somehow makes scientific knowledge less reliable or less objective. That confuses accounting and justifying. After all, Einstein and Darwin gave arguments for their theories, and those arguments were far from being all erroneous. Therefore, even if Carnap's and Popper's epistemologies were entirely misguided, that would not begin to cast doubt on relativity theory or evolution.

So Sokal is trying to equate social authority of Darwin with that of physics, even though the two are much different. He also mentions Popper without half a sentence on his arguments that good science (like Einstein's) often tests its theses through accurate predictions. Moreover, he sees a "fundamental error" in asking about something that is the most obvious question. If you believe science, and not, say, an Amazonian shaman, and you want me to believe, then tell me why. Maybe a separate answer to why you believe Einstein and a separate one to why you believe Darwin would make things much easier?

> Moreover, the underdetermination thesis, far from undermining scientific objectivity, actually makes the success of science all the more remarkable. Indeed, what is difficult is not to find a story that "fits the data", but to find even one non-crazy such story. How does one know that it is non-crazy? A combination of factors: its predictive power, its explanatory value, its breadth and simplicity, etc. Nothing in the (Quinean) underdetermination thesis tells us how to find inequivalent theories with some or all of these properties.

This type of argumentation hardly helps. Whether is something "remarkable" or "crazy", depends on personal opinion, a value judgement; we would rather want to define success in objective terms, as Popper was, at least in part, able to do. Secondly, doesn't he know that until the 13th century we had the only simple, universal, all-explaining, "non-crazy" theory, according to almost all scholars, of Aristotle, which is now considered completely false? Thus, Sokal forfeits the game to irrationalists. It is not surprising, therefore, that in criticizing Feyerabend (p. 196), he does not cite the key argument from "Against Method," although the book has a very clear analytical index. His arguments focus on how Feyerabend dares to proclaim such-and-such theses against established orthodoxy, which further confirms the fact that science in the understanding of the scientism is a typically Kuhnian phenomenon; except that the current paradigm, in his opinion, is his whole world, and he is the comrade first secretary of this world. What Sokal quotes from Feyerabend to refute him, rather refutes Sokal himself (p. 200):

> Onces Feyerabend has made the leap to "anything goes," it is not surprising that he constantly compares science with mythology or religion, as, for example, in the case of the following quote: Newton reigned for

> more than 150 years, Einstein briefly introduced a more liberal point of view only to be succeeded by the Copenhagen Interpretation. The similarities between science and myth are indeed astonishing.

And this is precisely a very elementary issue raised by Feyerabend: in the 18th and 19th centuries, mechanical philosophy was broadly adopted, with all the phenomena were to be explained by the interactions of balls and springs. Then suddenly it turned out obsolete, and what's more, another "universally true" theory called the Copenhagen interpretation appeared. What to do with this? Sokal answer is more or less what one could expect of him at this point, by claiming humbly that myths cannot change when experiments contradict them. In reality, mechanical philosophy was very much like very superstitious myth, produced for no rational reason on a shallow understanding of Newton, highly resistant to any evidence contrary to it, and finally collapsing when contrary evidence accumulated.

7 Remarks on Sociology and Political Philosophy.

7.1 Materialism and Scientism of the Enlightenment, and Naive Realism.

The desire to repair the civilization and the society, from supposedly scientific positions, appeared in the 18th century. It grew out of the errors of natural philosophy, which are still relevant in the 20th and 21st centuries, and to this day animate the minds of various advocates of this kind of political and social order. Mechanical philosophy occupied a central place in relation to them. We know that D'Alembert[175], Kant, and Laplace[176] believed that classical mechanics is the ultimate and only true theory of everything that exists, and that experimental evidence is unnecessary to demonstrate this. This naive realism developed in the 19th century and even survived the revolution of 20th century physics, becoming naive realism with respect to other theories (e.g., the Copenhagen interpretation of quantum mechanics or, recently, the theory of many universes).

However, claims in physics are not the core of mechanical philosophy, but a reinterpretation sailing on the wave of common currents of thought, originating mainly from Helvetius and Holbach in the mid-18th century. These currents shaped a kind of anthropology and sociology, whose adherents seized control of France during the French Revolution. The word "mechanism" refers not so much to Newtonian mechanics, but to the way of imagining man and society, as a kind of machine composed, as it were, of gears and springs, or hydraulic elements. These images had an intense impact on the collective imagination, especially in people who had some interest in believing them. The "lucky ones of this world," as Rousseau called them, willingly recognized man as a machine, whose entire future is already predetermined by the gears that move it and the influences of the environment. Then man does not choose his decisions at all and does not bear moral responsibility for them, even if he spends all day stealing, cheating, and giving

[175] Zawistowski, *Order and Contingency*, p. 97
[176] ibid., p. 102

himself up to debauchery. From this philosophy, enthusiastically adopted by the enlightened elites, an unexpected conclusion follows: if, in fact, the external environment and sensory impressions control man, then by manipulating the environment and impressions, one can effectively manipulate both the individual and society. This is a powerful promise, which can be to used to build a better and happier society. This phenomenon, conventionally called scientism, is precisely the leitmotif of the decades after the Revolution, from 1789. A recently published book by X. Martin[177] provides much evidence for such inspiration of the main organizers and leaders of the revolution, which we will cite in a moment. A vision emerges from it that explains a great deal about the ways of thinking of various kinds of the extreme left: about democracy, freedom, liberation, good, evil, and above all, man.

7.2 Characteristics of Scientism According to F. Hayek

Friedrich Hayek[178], an economist of the Austrian School, wrote an important characterization of scientism, which, interestingly, correspond very well with the thesis of the materialistic origin of scientism[179].

First, the author points out, scientist proponents feel the need to apply the method and mathematical apparatus of physics to the humanities. Hayek argues that in physics, the description using mathematical relationships between measured quantities replaces the sensory images we see, because in physics this approach works better in predicting the results of experiments. In sociology and psychology, the opposite situation occurs, because, Hayek points out, the main object of interest are human decisions and perception

[177]Martin, *[French Revolution and Human Nature] Rewolucja Francuska, a Natura Ludzka*

[178]Hayek, *The Counter-Revolution of Science: Studies on the Abuse of Reason*

[179]I do not intend here to directly support the cheerleaders of the unlimited free market detached from the ethics of virtues and other aspects of teleological philosophy. The theories in sections 1.7-1.9 indicate the problems of unlimited competition and the elevation of own benefits as something necessarily good. After all, some of the ringleaders of the French Revolution held almost identical doctrines.

of reality. This perception, in turn, is based on sensory images, so it is impossible to exclude them without harming our research. On the other hand, materialism and mechanism justify such an approach, seeing with the eyes of imagination human activity and decisions as a mechanical phenomenon, the interaction of "screws and springs." A description closer to the description of mechanisms is therefore better for adherents of scientism. Another factor is their admiration for the achievements of the exact sciences and the desire to apply the same method in other fields, while at the same time twisting its meaning.

Secondly, scientism neglects the purposefulness of human actions, i.e., the rational ordering of these actions with regard to the future effect. How, for example, to explain the phenomenon of the market? A craftsman or entrepreneur strives to provide such goods and services as customers want to buy, also trying to make his offer advantageous compared to the goods and services of competitors. The customer buys what is useful to him for some purpose, often also hoping to limit his expenses. The market is a great mosaic of purposeful, rational actions of the entire population; and, as a whole, it works well in solving problems and optimal allocation of resources. A key role is played by the rationality of individual people, who, unlike gears, will not mindlessly do something that is inefficient and are able to predict and adapt to changing circumstances. For some 200 years, various progressive sages did not want to accept this, hence the communist economy and other failed programs of top-down controlled economy and society. For a materialist, such a view of humanity is reasonable, because, in his opinion, people do not make rational decisions (they do not make them at all). To understand this better, let's recall what free will is. St. Thomas gave a definition that I consider useful. Man, using reason, imagines some future effects of his action: maybe I would run, maybe I would help my mother, maybe I would cut down a tree, maybe I would drink a beer, etc., and attributes to these effects some goods, according to the ethical theory of section 1.8. Whether it is well-being, feeling better, virtue and duty, or physical health. The will follows the good presented by the intellect, but free choice is precisely in choosing one of the many presented goods. Decisions and actions are not directly related to impressions, but only our thoughts attribute consequences to decisions, and also value the consequences as good or bad. From impression to decision, we are separated by a lot of intellectual activity, which we also feel as free; and this same activity in various fields is the subject of interest of ethics, economics, sociology, politics, etc. A materialist, not wanting to recognize free will in ethics, cannot recognize rational and free decisions elsewhere either; similar to the dependencies I pointed out in section 1.9. From this peculiar property arises an equally peculiar and interesting trait of scientists, which Hayek points out[180]:

> ... they are led to believe that no result of the action of many men can show order or serve a useful purpose unless it is the result of deliberate design.

A surprising conclusion, because the philosophy of Darwin, popular among materialists, is based on the assumption that a blind process can create complex, organized structures. If so, then all the more they could accept that the rational planning of many people also shows the ability to organize. However, materialists avoid this conclusion, because their anthropology, which sees man as equal to an animal, without a significant role for the higher functions of his mind, is of paramount importance to them. Darwinism, as a philosophy of evolutionary pantheism, could also inspire a theory of *rational* self-organization of society, but the emphasis on equating man with animal and undermining the importance of reason and will directed it towards the paths of barbaric social Darwinism and eugenics, about which in a moment. Hayek sees well the connection of this doctrine with the anthropology of the Enlightenment, pointing to the tendency to recognize all social organization as an example of intelligent design.

> They are therefore forced to the opinion exactly the same that, until the eighteenth century, convinced people that language, or the family, had been "invented," or that the state had been created by an explicit social contract.

Considering man in enlightened sociology, we are to accept that all visible organization is rationally designed, and man must have

[180](Hayek, *The Counter-Revolution of Science: Studies on the Abuse of Reason*), p. 80

had the mental abilities in advance to design this organization; and latent abilities, incidentally, could not arise on the basis of the selection of beneficial traits. At the same time, a similar thesis would be very poorly viewed in environments closer to biology. The philosophies of materialism thus proclaim contradictory theses, depending on which postulates they are defending at a given moment.

This conclusion correlates with the collectivist approach to the study of human society. This is[181]

> methodological collectivism, [that is] its tendency to treat "wholes" like "society" or the "economy," "capitalism" (as a given historical "phase") or a particular "industry" or "class" or "country" as definitely given objects about which we can discover laws by observing their behavior as wholes.

"Economy" or "capitalism" is not an object, but a certain mental description of many enterprises, commercial transactions, labor relations, contracts, credits, etc., and the mutual relations of all this. What we can say about the economy is rarely a concrete fact like "the dog barks" or "carrots grew in the field," but a theory or hypothesis. This confusion of theory and fact seems to be[182] another major error of scientists, which can also be called "conceptual realism," or the fallacy of misplaced concreteness, according to A. N. Whitehead's terminology. It leads to excessive certainty about the theory, because its subjective and contingent character is hidden when it is presented as an "objective fact" — this is exactly the same ploy that Fisher used for Darwinism and statistics. A scientist engaged in sociology or economics could calculate some aspect of the collective, for example, the GDP per capita of a country and correlate it with other similar factors (standard of living and social development) and say that this is "objective," and therefore constitutes a scientific law. However, this ignores a large part of the interesting phenomena. GDP, for example, correlates with wealth in some issues, but not in others. It is, for example, higher if an identical service or thing is more expensive. If money

[181] ibid., p. 52
[182] ibid., p. 54

is spent on armaments, removing the effects of a cataclysm, or treating a disease that does not appear in other parts of the world; all this also increases GDP. In fact, there is a recognized economic theory[183], in which greater demand for the services of a glazier, thanks to a broken shop window, is something good and beneficial. Incidentally, the owner loses funds that he could invest in the development of his business. However, if we do not recognize the possibility of making decisions, It is easy to ignore such a circumstance and assume that rather the environment must provide the impetus: a need must be created, or the authorities must explicitly allow someone to do something.

Closely related to the errors of collectivism and objectivism is a third one, called historicism. Historicism is the view that assumes immutable and universal laws of the development of history, for example, those proposed by Marx, foretelling the inevitable arrival of the communist revolution, when the working class obtains class consciousness. Here is an interesting comment for us by Hayek (ibid, p. 68):

> There are very good reasons... s why, generally speaking, in the natural sciences the search for general laws has the pride of place, with their application to particular events usually little discussed and of small general interest... In most natural sciences the particular situation or event is generally one of a very large number of similar events, which as particular events are only of local and temporary interest and scarcely worth public discussion (except as evidence of the truth of the general rule). The important thing for them is the general law applicable to all the recurrent events of a particular kind.

We cannot fully agree with this: this may be physics or chemistry as it is taught in school, giving ready-made theories on a platter, but this is not the practice and history of these sciences, where particular phenomena are also among main subjects of public discussion. A well-known myth suggests that Newton's theory arose in a short time when an apple fell on the author, but it was not

[183] Keynes's, which we mentioned in section 1.9

the idea itself that was most important, when Hooke and Huyghens were working on similar hypotheses. However, it took a few years to show that the theory actually allows to calculate and predict many different phenomena on Earth and in the sky. Moreover, many significant discoveries within the theory happened after Newton's death. Clairaut, Laplace, and LeVerrier developed the mechanics of the heavens, accurately predicting the orbits of new celestial bodies; Cauchy and Euler laid the foundations for continuum mechanics; Euler and Maupertuis reformulated mechanics using the variational principle; Maxwell and Boltzmann linked thermodynamics with the statistical approach to dynamics. All this was related to the effort to describe and predict ever new experimental results and provided technical development and the entry point to the discovery of quantum mechanics and the theory of relativity. Similarly, physics works the other way around, explaining something using theory: to understand the principle of operation of an instrument, or phenomena in nature, we must interpret them based on known theories (I showed examples on p. 72).

This is exactly the same blindness of scientists and the Enlightenment that we have already mentioned, and Hayek repeats it as a probably common opinion, not wanting, however, to recognize a similar blindness in the social sciences, in which particular events are much more important. An event is not only something complex and multi-level, but also happens to have broad consequences for hundreds of years to come [184]

> In the social field, on the other hand, a particular or unique event is often of such general interest and at the same time so complex and so difficult to see in all its important aspects, that its explanation and discussion constitute a major task requiring the whole energy of a specialist. We study here particular events because they have contributed to create the particular environment in which we live or because they are part of that environment. The creation and dissolution of the Roman Empire or the Crusades, the French Revolution or the Growth of Modern Industry are such unique com-

[184] Hayek, *The Counter-Revolution of Science: Studies on the Abuse of Reason*, p. 68

plexes of events...

It is difficult to expect general laws of sociology that would apply before the French Revolution and after, before the industrial revolution and after: social changes are too large and unique, and it is impossible to compare them to the laws of physics, operating everywhere and always the same.

Thus, Hayek characterizes scientism as a pseudoscientific attempt to liken the social sciences to physics, while removing the more effective analysis of intentional human actions using final causes in these sciences.

7.3 Scientism and Mechanism of the French Revolution

The first huge laboratory of scientism was France in the revolutionary period, from 1789 to the rule of Napoleon. The French Revolution is often presented as focused on the ideals of democracy, civil liberties, tolerance, and the like. However, a shadow is cast on this vision by the far-from-idyllic outcome, especially the large number of political murders and brutal terror; this suggests therefore also other motivations. We can find the motivations in the writings and speeches of the main actors of those events, drawing on the work of Martin[185]. As we have already written, most of them adhere to a materialistic anthropology, undermining the existence of free will and proclaiming that people are controlled by impressions and instincts.

Mirabeau (d. 1791), marquis, president of the National Assembly and member of the Jacobins [186] wrote in 1776 the "Essay on Despotism." Man according to Mirabeau is a "good and just animal that wants to have fun." Moreover:

> law, that is, order, is entirely based on sensory impressions and the physical needs of man who, by nature, has as much ability to enjoy life as nature itself has given him pleasures at his disposal. Therefore, it

[185] Martin, *[French Revolution and Human Nature] Rewolucja Francuska, a Natura Ludzka*

[186] ibid., pp. 119-120

> is in the very heart of these joys, in their distribution, in their ordering, in their multiplication that the social code must be sought.

The liberation of man is therefore the liberation of instincts, in accordance with what the most militant materialist, Holbach, wrote earlier (ibid., p. 119):

> Have fun, because *nature demands it of you*, and also allow others to have fun, because *justice demands it* and enable them to have fun; this is the advice that holy humanity gives you.

In Mirabeau, as in Holbach, sensualism goes hand in hand (Martin notes) with hedonism embodied in life, taking pleasure to the fullest regardless of various old-fashioned conventions. Basing the legal system on such a convenient philosophy not only allows these kinds of behaviors to be normalized, but also enables a kind of social engineering, which Mirabeau talks about in his speeches (ibid., p. 123). Man is "guided by his sensory experiences" so he can be controlled "thanks to objects that make an impression on him, thanks to striking images, thanks to great spectacles, deep emotions," and a "completely absurd reorganization of society" can be shown to him as attractive (ibid., p. 124). Man "believes impressions more than reason," so by taking control of his imagination he can be made docile. This raises a problem, because behaviors useful to society, such as work, paying taxes, or honesty, are not associated with pleasant impressions, but the sages strongly believe in a kind of harmony resulting from being guided by pleasure. Condorcet, the most important representative of the Age of Enlightenment who lived to see the revolution (and even had the honor of being devoured by it), ponders this when "taking into account both the use of contraception and the technical possibilities of controlling gender, he tries to refute the objections of a demographic nature" (ibid., p. 121). Does egoism and hedonism oppose the procreation of children? No, the philosopher believes, because each sex has an interest in procreating offspring of the opposite sex. Men want to have affairs with women younger than themselves, and women want men to have less choice and not be picky about youth. This is a very interesting picture of humanity, it must be admitted. Mirabeau's reader was another Jacobin aristocrat, d'Antonelle (ibid., pp. 125-127). In his notes, he deals "with the alleged superiority of man over animals," calls free will a "philosophical fraud," and "constantly" praises Helvetius. About man, he writes that "all body movements, consciousness... everything that makes him capable of thinking, of speaking..., results from a certain mechanism." Moreover, he is "always deceived... by the one who can charm him most strongly and most cleverly." Sieyes, the main political theorist of the years 1789-1791 and by no means a materialist, also adopts a scientistic sociology, e.g. (ibid., p. 128) writing "we will never understand the social mechanism if we do not decide to perceive society as a simple machine." So even the first, relatively herbivorous years of the revolution were strongly marked by a materialistic program of social engineering. Materialism reached the common people in the years 1792-1794, with the Great Terror, brutal persecutions of Christianity, and especially the clergy, and the establishment, also by force, of the atheistic Cult of Reason. The latter phenomenon should be properly understood in the light of the presented theory. The leaders of the revolution did not believe that "Reason" demanded any prayers, the purpose of this cult was psychomanipulation and control of the masses, according to Mirabeau's thought. The Catholic Church, quite naturally, was seen as competition for power over souls, which had to be eradicated as soon as possible. Many other actions of the leaders of the Great Terror have a similar feature. The calendar was changed, counting years from 1793, not from the birth of Christ. Street names, state symbols were changed, monuments and places of remembrance were dismantled. Among the several tens of thousands of executions, the king and queen were also killed, which evokes associations with the spectacles that the engineers of impressions served up later, e.g., publicly burning the constitution of 1791.

Incidentally, in addition to inventing a new religion for the people, the revolutionaries also believe in something themselves. In Robespierre, the main leader of the Great Terror, this is particularly striking. Strict mechanism should theoretically not judge anyone, because it recognizes neither free will nor moral responsibility. However, this (as Martin notes[187]) generates significant problems,

[187]Martin, *[French Revolution and Human Nature] Rewolucja Francuska, a*

because "unleashing all forms of egoism" does not create the harmony promised by Mirabeau, but rather corruption and theft, also rampant in the highest echelons of popular power. Robespierre is forced to demand *effort* from his subjects, to which, of course, according to the dominant atheistic anthropology, "man is completely incapable" (ibid.). In his own case, elements of Rousseau's philosophy play a greater role, to whom Robespierre even dedicated an enthusiastic eulogy. And in Rousseau, the progressive philosopher Slavoj Žižek[188] sees the main problem of the so-called Jacobin paroxysm:

> As to philosophical roots of this limitation of egalitarian terror, it is relatively easy to discern the roots of what went wrong with Jacobin terror as lying in Rousseau who was ready to pursue to its 'Stalinist' extreme the paradox of the general will:

and then there is a quote from Rousseau:

> Apart from this original contract, the votes of the greatest number always bind the rest; and this is a consequence of the contract itself. Yet it may be asked how a man can be at once free and forced to conform to wills which are not his own. How can the opposing minority be both free and subject to laws to which they have not consented? I answer that the question is badly formulated. The citizen consents to all the laws, even to those that are passed against his will, and even to those which punish him when he dares to break any one of them. The constant will of all the members of the state is the general will; it is through it that they are citizens and free. When a law is proposed in the people's assembly, what is asked of them is not precisely whether they approve of the proposition or reject it, but whether it is in conformity with the general will which is theirs; each by giving his vote gives his opinion on this question, and the counting of votes yields a declaration of the general will. When, therefore, the

Natura Ludzka, p. 168

[188]Robespierre, *Virtue and Terror*, p. xxii

> opinion contrary to my own prevails, this proves only that I have made a mistake, and that what I believed to be the general will was not so.

The goal of revolutionary democracy is not so much to establish such laws that 50% of society, or 50% of deputies, agree to, but those that are in accordance with the "general will," some kind of collective striving of the community for the common good. This does not yet tell us why the striving for the common good ended in mass murder, since murder seems to oppose this common good. Nor does it say why the general will should exist and stand above individual wills (leaving aside the opinion of materialists that individual wills do not exist). The answer, however, is already contained in Rousseau's theory. He argued that man is naturally good, but the influence of civilization corrupts him through inequalities and artificial needs. So in prehistoric times there existed a "noble savage," who was guided by instincts and perceived the "general will" clearly and distinctly. From this, it can be deduced that all the structures of civilization are an obstacle on the road to happiness. In Robespierre's speeches, we find a consistent understanding of the good[189]:

> Now, what is the fundamental principle of democratic or popular government, the essential mainspring that supports it and makes it move? It is virtue; I am talking about the public virtue that worked such prodigies in Greece and Rome, and that should produce far more astonishing ones in republican France; that virtue that is none other than love of the homeland and its laws. But as the essence of the republic or of democracy is equality, it follows that love of the homeland necessarily embraces love of equality. It is also true that this sublime sentiment assumes the primacy of the public interest over all individual interests; which implies that love for the homeland also assumes or produces all the virtues: for what are they, but the strength of soul needed to make people capable of such sacrifices? And how could a slave of avarice or ambition, for example,

[189] "On Political Morality" Robespierre, *Virtue and Terror* pp. 115-125

> sacrifice his idol to the homeland? Not only is virtue the soul of democracy; it can only exist in that form of government.

Virtue is no longer either the goal of reason and will, like the cardinal virtues, or an aspect of internal nobility and perfection, nor does it refer directly to other people (even one's own family and children). Virtue, he says, is nothing else than love for the homeland and its laws, because the state and its laws are the general will and therefore the supreme good and value of uncorrupted human nature. Moreover, the old order, originating not from this nature, but from corrupting civilization, must fall and perish, and the revolutionaries cannot go too far in crushing it. For example, there is no point in holding trials for the enemies of the people, because legal and procedural norms are precisely an element of this corrupt order (ibid.):

> All who interpose their parricidal gentleness between these scoundrels and the avenging sword of national justice resemble those who would rush between the tyrants' henchmen and our soldiers' bayonets; all the fervours of their fake sensibility seem to me nothing but languishing sighs, directed towards England or Austria... The aristocracy is better defended by its intrigues than patriotism by its services. We want to govern revolutions with palace quibbles; we deal with conspiracies against the Republic like trials of individuals. Tyranny kills, and liberty pleads; and the code made by the conspirators themselves is the law by which they are judged.

Similarly, for Saint-Just, every king is a usurper[190], not just Louis by virtue of some of his misdeeds. This theory very well explains the attitude of a certain kind of extreme left to democracy, which they do not treat as a process based on the agreement of a greater part of society. The general will counts, which is best known to the self-proclaimed elite, and voting is only an advisory body. Hence, we will not be surprised by the constant coups d'état (e.g., under-

[190]ibid., p. xxii

mining the election results in 1797-1798[191], because it violated the "sovereignty of the people"). Nor that Canabis praises Napoleon's constitution as the pinnacle of democracy (ibid., p. 287), in which elections have no legal effect, thanks to which "everything is done for the people and in their name," and nothing "under their idiotic command."

The second key attribute is the philosophy of good and evil: "love for the homeland and its laws produces all virtues," and if someone does not like the new state, like, for example, the peasants of the Vendée, then he is a villain and deserves death. Moreover, popular power has an unlimited mandate to repair the world by force, and the basis seems to be (as we have quoted) that the virtue of love for the state "produces all virtues," and is therefore the basis of a moral and fulfilled life. This is a mutation of Mirabeau's program (no wonder Robespierre calls virtue a "sublime feeling" and also speaks of "sublime and noble egoism" according to Rousseau's theory that man should be guided by feeling and senses, see Martin, pp. 183-184), of proper manipulation of the people through impressions, now acquiring an eschatological character, of absolute good, for which everything else must be crushed and overthrown.

Quite peculiarly, the Jacobins (ibid., p. 178), brutally persecuting the Catholic Church, felt compelled in May 1794 to restore faith in God and the immortal soul, wanting to convince their subjects that they are individually responsible for their deeds, similarly to the opinion of the Church, and contrary to the materialists. However, there is no contradiction here in the light of scientism: the deistic creed is *useful* so that the authorities can persuade their subjects to obey and behave well. Robespierre himself noted that (ibid., p. 178):

> In the eyes of the Legislator, everything that is useful to the world and good in practice constitutes truth. The Idea of the Supreme Being and the immortality of the soul constitute an unceasing call to justice; it is therefore social and republican.

The power of the Jacobins barely lasted 2 months from this outburst of opportunistic piety. The spark for the coup was Robe-

[191] Martin, *[French Revolution and Human Nature] Rewolucja Francuska, a Natura Ludzka*, p. 255

spierre's tirade in the National Assembly against some thieves and bribers unknown by name, which suggested another purge in the highest circles of power. Some dignitaries, bearing in mind their own lives, therefore led to the arrest and execution of Robespierre, which went down in history as the Thermidorian Coup. From the ashes of terror emerged a new system, called the Directory. The Directory represented the faction of the bourgeoisie, being largely riddled with corruption and focusing on preserving the privileges of those who had grown rich and powerful thanks to the Revolution. At the same time, the most radical and violence-prone revolutionaries were pacified and a somewhat more moderate government was established.

However, scientistic tendencies revived again, Hayek points out, according to the thought conveyed by one of the journals of the time [192]:

> The Revolution has razed everything to the ground. Government, morals, habits, everything has to be rebuilt. What a magnificent site for the architects! What a grand opportunity of making use of all the fine and excellent ideas that had remained speculative, of employing so many materials that could not be used before, of rejecting so many others that had been obstructions for centuries and which one had been forced to use.

The main methods barely changed. Martin points out[193] that

> in this post-Thermidorian time there is no reform project aiming at man and social life... that would not be marked... by the conviction that one should draw from the recommendations and resources offered by sensualism.

Further attempts are made to educate the people through appropriately prepared impressions. An example is the procedure of national holidays as (ibid., p. 196) a way of manipulation, thanks to exerting attractive sensory impressions:

[192] Hayek, *The Counter-Revolution of Science: Studies on the Abuse of Reason*, p. 109

[193] Martin, *[French Revolution and Human Nature] Rewolucja Francuska, a Natura Ludzka*, p. 195

> The administration of the Directory, which on June 8, 1796, establishes the way of celebrating the feast of agriculture, referring to the serious argument that "evading the public worship that agriculture deserves constitutes an undeniable sign indicating the enslavement and corruption of the nation... Behind a plow decorated with foliage and flowers, a cart moves with a statue of liberty holding in one hand a cornucopia and with the other hand it will point to the tools used for cultivating the soil gathered at the front of the cart. Plowmen will mingle with the group of citizens under arms, and when everyone receives a specific signal, they will hand the armed men tools for cultivating the soil, and those will hand them their rifles. To the sound of fanfares and hymns, the chairman of this assembly will drive the plowshare into the ground and begin the first furrow. The plowmen will give the armed citizens their rifles decorated with ears of corn and flowers, and I will take from them their tools of work, to which tricolor ribbons will be attached, waving in the wind.

The main figures of the Directory strongly believed in the effectiveness of this kind of psychomanipulation. La Levelier-Lepaux said that[194]:

> The gathering of a large number of people, animated by the same feeling, expressing their convictions simultaneously and in an identical way, exerts an influence on souls that cannot be resisted, and the result is difficult to overestimate.

His good friend Leclerc [195] believed in turn that the rebellion of the peasants in the Vendée in defense of the king and the Church "constituted a pathological reaction of these simple, unrefined peasants to the acute lack of pleasant sounds, when they were too abruptly deprived of access to the Sunday melodies to which they had been accustomed since birth."

[194] Martin, *[French Revolution and Human Nature] Rewolucja Francuska, a Natura Ludzka*, p. 239

[195] ibid., p. 245

It is not surprising that the Thermidorian coup also had to be properly celebrated with the "Festival of Liberty" (ibid., p. 197) During the celebrations, decorated actors "to the sounds of military music" move towards the throne, on which lie "a scepter, a crown, a coat of arms, and a booklet with the inscription 'Constitution of 1791'," to "furiously attack this throne." After which, the next day, they are to burn a second throne, on which there is a mask, a dagger, and the Constitution of 1793. In this way, the Directory probably wanted to program that the new government is much better and more popular than the previous two, organizing annual ovations for themselves. However, this did not work that well, and the election procedure deserves special attention in this regard. When the elections of 1798 ended in a victory of a large part of the mandates by the Jacobins, the Directory annulled their result (ibid., p. 255), and did the same a year earlier, when a large number of royalists won mandates. If we recall the aforementioned concept of "general will," immediately the explanations of these measures will make sense, that it is about canceling, quote, "elections contrary to the will of the people" and, that one should respect "all those elections that bear the hallmarks of the national will." The will of the people is not, therefore, what results from a greater number of votes cast, but a real entity, to which a handful of chosen ones have the best access. These incidents, called the coups d'état of the month of Fructidor and the month of Floréal, betray a certain weakness, which turned out to be the beginning of the end of the Directory: in order to keep the people in line, it relied on the army; against the army itself, therefore, it was defenseless. About a year and a half later, in October 1799, the so-called coup of 18 Brumaire took place, organized by General Napoleon Bonaparte, who thus seized almost dictatorial power. This did not happen without the support of part of the government: Sieyes, Talleyrand, and Napoleon's brother, Lucien. Napoleon had already made sure to curry favor with the scientistic intellectual circles, being elected to the National Institute (ibid., p. 282). participating in meetings of the association from Auteuil (ibid., p. 284) and visiting the Ecole Politechnique to "seek solace in the exact sciences." Scientistic elite ("ideologues") therefore considered Napoleon their own. The well-known materialist philosopher Cabanis even helped in the coup of 18 Brumaire and contributed to the drafting of the Napoleonic constitution (ibid., p. 287). Laplace, the leading mathematician of the time and a supporter of the opinion that everything is determined by the laws of mechanics, became the Minister of Internal Affairs , (ibid., p. 302) — but he did not prove himself as an administrator and was removed from office (he has ended up in the senate instead). The paths of Napoleon and the ideologues diverged quite quickly. Napoleon, being rather a practitioner and an opportunist, borrowed some of their doctrines and replaced others. A particular disappointment of the scientists (ibid., p. 306) was the concordat with Catholic Church, where Napoleon believed that "it would be absurd to fight religion, with which the vast majority of the inhabitants of France are associated and which guarantees the rulers things that are very beneficial for the quality of the social fabric." The co-author of the Napoleonic Code, Portalis, had on this occasion the valuable observation that the "happy customs" conveyed by the Catholic religion were a safety valve for the Revolution:

> Great devastation has taken place in France, but what would our country have become if these customs, *acting without our consciousness*, had not served as a counterweight to our passions?

While freedom of religion was restored, the anthropology seeing man as an essentially passive being guided by impressions did not change. This also, Martin points out in the penultimate chapter of the book, is the main leitmotif of the Napoleonic Code.

7.4 Darwinian Scientism: Eugenics, World Wars, the Painter, etc.

I have already described the teleological foundations of science, ethics, and also military and political strategy; and above all the influence of Ronald Fisher and company on the statistical method. This will allow me to shed new light on the history of yet another "scientism," perhaps the most dangerous and terrible of all[196].

Recently, R. Weikart, a professor at California State University, published a series of books documenting the role of Darwinism in

[196] The subsection below was previously published as an article in "Zawsze Wierni."

the ethical and sociological changes that found their finale in the rise to power of the NSDAP and German crimes during World War II. The books document the widespread influence of Darwinism on the relativization of murder and war as an "evolutionary advantage," the dismantling of traditional moral systems, and the degradation of the value of human life to the animal level. At the same time, outraged critics have come forward with a number of charges: that there were many other significant components of Hitler's ideology, that some propagators of Nazism were not Darwinists, and that Weikart is supposedly biased somehow.

The facts of history are complex and often elude simple judgments. At the same time, however, philosophy allows us to grasp the most important essence of things, providing tools such as the priority of final causes and the distinction between sufficient and necessary causes and secondary ones. So question is: what plan did the Nazis come up with and put into action to seize power, and what did they want to achieve by committing countless crimes (i.e., what are the final causes) and, secondly, what were the components that made this plan possible (i.e., what are the necessary and sufficient causes).

From this perspective, it does not seem that paganism, immorality, Eastern religions, ethnic hatred, and other such attributes of the German Nazis are the most important: all these things have already been present in many different people, without necessarily leading to similarly tragic effects. Moreover, "selling" aggressive and hateful ideologies to the wider population generally encountered difficulties. We said that humans by his nature seems to strive for good, peace, and justice, explaining this either by religion or by morality. To dismantle these obstacles, one can relativize evil deeds as being in fact a greater good, which, however, the simple people do not yet understand. It is also good to rely on the authority of expert knowledge: after all, science in the 19th century, thanks to people like Ampere, Maxwell, or Pasteur, gained quite a bit of social credibility. Moreover, it is worth promising miraculous benefits if only the public believes us and complies with our demands and threatening a catastrophic scenario if only we are ignored. We also observe all these manipulations of public opinion in the 21st century, so they should not be a big surprise.

Specifically, it was like this: a group of scientists at the end of the 19th century stated that, in light of Darwinian evolution, the survival of sick, weak, or otherwise poorly adapted people, or those considered "inferior" races, is not beneficial, because the propagation of their genes negatively affects the entire species, even leading to the decline of the entire nation. At the same time, the intense selection of the most perfect individuals gives rise to the hope of a great improvement of the human race, thanks to the accumulation and spread of beneficial changes. **This is what Charles Darwin himself writes in "The Descent of Man"**[197]:

> With savages, the weak in body or mind are soon eliminated; and those that survive commonly exhibit a vigorous state of health. We civilised men, on the other hand, do our utmost to check the process of elimination; we build asylums for the imbecile, the maimed, and the sick; we institute poor-laws; and our medical men exert their utmost skill to save the life of every one to the last moment. There is reason to believe that vaccination has preserved thousands, who from a weak constitution would formerly have succumbed to small-pox. Thus the weak members of civilised societies propagate their kind. No one who has attended to the breeding of domestic animals will doubt that this must be highly injurious to the race of man. It is surprising how soon a want of care, or care **wrongly directed**, leads to the **degeneration of a domestic race**; but **excepting in the case of man himself, hardly any one is so ignorant as to allow his worst animals to breed.**

Darwin was not the first to propose eugenics from a scientific position, but he certainly did it along with others. A few lines later, Darwin[198] indicates that he only supports humanitarian measures such as marriage restrictions and that we should not, in the name of "the noblest part of our nature," limit compassion even in the name of "hard reason." His opponents, however, would rather be interested in whether the above theses are really postulates of "hard

[197] Weikart, *Darwinian Racism*, p. 249
[198] Darwin, *The Descent of Man, and Selection in Relation to Sex*, p. 90

reason." Darwin may be humanitarian in his secondary opinions, but at the same time, in the name of "Science," he unleashes something very dangerous. Protecting the weak and disabled, he says, is a threat, because it is done at the expense of the evolutionary well-being of the entire population. Actions to reduce their misery are not effective, because they themselves will quickly increase this misery in their offspring. This theory was adopted in England by three famous Darwinists, Francis Galton, Karl Pearson, and Ronald Fisher, developing the field of eugenics, which aimed at the directed evolution of man. A scientific eugenic journal and circles aimed at promoting the new field were quickly established. At one of the meetings of the Eugenics Education Society in 1909, the Anglican pastor Pelle captured the essence of this work. He says that[199] the doctrine of eugenics "start les the sensibility of the unlearned" directly undermining the concept of traditional Christian philanthropy. But this concept was **due for an update anyway**, in a situation where the old idea that every life is worth saving combined with advances in science to create "**a great army of mental and physical imbeciles, who are in the strictest sense artificially kept alive, without regard to the eugenic interests of the nation**."

Christian charity is therefore not good in a situation where eugenics indicates a greater good (evolutionary success), as well as the need to avoid a greater evil (the degradation of the nation through the multiplication of 'imbeciles'). Fisher, already known to us and called by Dawkins one of the most outstanding Darwinists, writes in 1914 as follows[200]

> The overmastering condition of ultimate predominance is nothing else than successful eugenics; the nations whose institutions, laws, traditions and ideals, tend most to the production of better and fitter men and women, will quite naturally and inevitably supplant, first those whose organisation tends to breed decadence, and later those who, though naturally healthy, **still fail to see the importance**

[199] Clayton, *Bernoulli's Fallacy: Statistical Illogic and the Crisis of Modern Science*, p. 105
[200] ibid., p. 155

of specifically eugenic ideas.

This, Clayton points out, will be a recurring theme in Fisher's scientific career. Making a career was clearly associated with a political agenda (elitist and racist one), hence the creation of demand for his expertise: those who reject eugenic science must inevitably disappear, he writes. Five chapters of the book "The Genetical Theory of Natural Selection"[201] (as we know, one of the most important works on neo-Darwinian theory) Fisher devoted to eugenics. Using data from the 1911 census, he concluded that the lower classes are characterized by a higher birth rate, which allowed him to predict the ruin of Great Britain. Fisher thus developed similar ideas of his older colleagues Karl Pearson and Francis Galton. Galton was Darwin's cousin and knew him well; he also developed eugenic theories first. He argued that good families should be encouraged to have more offspring, while discouraging or prohibiting it for those "afflicted by lunacy, feeble-mindedness, habitual criminality, and pauperism" (Clayton, p. 134). In addition to the stick, he also promised a carrot: a utopian society in which, Clayton writes, the improved moral and intellectual qualities of its members allow most problems to be eliminated. As early as 1865, he wrote:

> If a twentieth part of the cost and pains were spent in measures for the improvement of the human race that is spent on the improvement of the breed of horses and cattle, what a galaxy of genius might we not create! We might introduce prophets and high priests of civilisation into the world.

Opinions about the application of Darwinism to man were also accompanied from the beginning by racism, which was not a rare phenomenon among the elites of Great Britain, but Darwinists for the first time proclaimed it in the name of Science. Galton believed, Clayton writes (p. 135), that the white race was the highest, because it had developed in the harshest environmental conditions. The black people to him were "lazy, palavering savages". Similar ideology is called Nordicism and was popular in Germany and the

[201] Fisher, *The Genetical Theory of Natural Selection*

USA. Zoologist Madison Grant, co-founder of the American Galton Society and propagator of Galton's doctrines, wrote one of the most influential books on this subject, "The Passing of the Great Race." Adolf Hitler wrote to Grant that this book "is his Bible"[202]. Grant is certain that the so-called "Nordic race" is superior as it evolved in harsh conditions[203]:

> The climatic conditions must have been such as to impose a rigid elimination of defectives through the agency of hard winters and the necessity of industry and foresight in providing the year's food, clothing and shelter during the short summer. Such demands on energy if long continued would produce a strong, virile and self-contained race which would inevitably overwhelm in battle nations whose weaker elements had not been purged by the conditions of an equally severe environment.

The extermination of the weak therefore gives the human race everything that is good, in his opinion, an opinion that Hitler ended up notoriously hurrah-enthusiastic about. Eugenics and "scientific" racism, incidentally, had been spreading in Germany much earlier. The precursors of German eugenics were the well-known for various machinations[204] militant materialist Ernst Haeckel, and then A. Ploetz, W. Schallmayer, as well as the social Darwinist L. Woltman. By the time of World War I, social Darwinism had reached the highest echelons of the German elites (e.g., the de facto war dictator Ludendorff[205]), which thus considered it appropriate to wage total war in the name of the domination of the "highest race." The American biologist Vernon L. Kellogg, while on a humanitarian mission in Belgium in 1915-1916, was shocked to hear how often officers of the German General Staff referred to Darwin's theory as "justification for waging war on behalf of the most perfect civilization"[206]. Kellogg writes[207]:

[202] Clayton, *Bernoulli's Fallacy: Statistical Illogic and the Crisis of Modern Science*, p. 157
[203] Grant, *The Passing of a Great Race*, p. 170
[204] Stanisław Bartynowski, *Apologetyka Podręczna*, p. 156
[205] Tipton, *A History of Modern Germany*, p. 291
[206] Jaki, *[The Savior of Science] Zbawca Nauki*, 132
[207] Kellogg, *Headquarters Night*, p. 28

> The creed of the Allmacht (omnipotence) of a natural selection based on violent and fatal competitive struggle is the gospel of the German intellectuals; all else is illusion and anathema.

and further (ibid, p. 29):

> This struggle not only must go on, for that is the natural law, but it should go on, so that this natural law may work out in its cruel, inevitable way the salvation of the human species. By its salvation is meant its desirable natural evolution. That human group which is in the most advanced evolutionary stage as regards internal organization and form of social relationship is best, and should, for the sake of the species, be preserved at the expense of the less advanced, the less effective. It should win in the struggle for existence, and this struggle should occur precisely that the various types may be tested, and the best not only preserved, but put in position to impose its kind of social organization its Kultur—on the others, or, alternatively, to destroy and replace them.

This very argument, Kellogg writes further, has become an impenetrable wall of logic and conviction in the minds of Germans. The sense of his book, published in 1917 during the Great War, is that peace with Germany can only be achieved if it is brought to capitulation. Attempts to negotiate with them in a situation where they are guided by Darwinian logic as above are worthless. That is why, in a short preface to this book, the former president Theodore Roosevelt writes of (ibid, p. 13) ”the shocking, the unspeakably dreadful moral and intellectual perversion of character which makes Germany at present a menace to the whole civilized world.” Two years later, in 1919, the well-known leftist playwright Bernard Shaw[208] stated that the blame for this state of affairs lay with professional materialists:

> But in the middle of the nineteenth century naturalists and physicists assured the world, in the name of

[208]Shaw, *Heartbreak House*, preface

> Science, that salvation and damnation are all nonsense, and that predestination is the central truth of religion, inasmuch as human beings are produced by their environment, their sins and good deeds being only a series of chemical and mechanical reactions over which they have no control. Such figments as mind, choice, purpose, conscience, will, and so forth, are, they taught, mere illusions, produced because they are useful in the continual struggle of the human machine to maintain its environment in a favorable condition, a process incidentally involving the ruthless destruction or subjection of its competitors for the supply (assumed to be limited) of subsistence available. We taught Prussia this religion; and Prussia bettered our instruction so effectively that we presently found ourselves confronted with the necessity of destroying Prussia to prevent Prussia destroying us. And that has just ended in each destroying the other to an extent doubtfully reparable in our time.

What changed after World War I? The opinion that Kellogg attributes to the Germans does not seem that widespread yet at that time. Importantly thinkers saw natural selection as a means to some specific goal, whether it was cleansing the genes of the human population or improving economic and social relations, e.g., through the free market. Atheists and modernists[209] themselves admitted that Darwinism is needed to attack Christianity. At the same time, they liked to claim humanitarianism and liberal views, not caring that by undermining free will and conscience, they themselves implicitly accuse themselves of operating with illusions, nor hiding their hostility to philosophical doctrines that really supported such humanitarianism.

Hitler in this situation does a very simple thing: he zealously accepts the existing, brutal creed about the miraculous abilities of natural selection, while rejecting all restraints as unnatural naivety and cowardice. The only law is the law of nature, or more precisely, the law of the jungle. And thanks to political backing, the mass media, and above all, drawing from Darwinism the appearance of

[209] Stanisław Bartynowski, *Apologetyka Podręczna*, p 161

scientificity of his doctrine, he can make the ruthless cult of natural selection reach the common people. In his writings and speeches, Hitler[210] " he constantly invoked the 'struggle for existence' and 'struggle for life,' both terms Darwin used to describe biological competition
":

> Politics is the striving and struggle of a people (Volk) for its daily bread and its existence in the world, just as the individual devotes its entire life to the struggle for existence, for its daily bread. And then comes a second matter, caring for future survival, caring for the child. It is the struggle for the moment and the struggle for posterity. And all thinking and all planning serve in the deepest sense this struggle for the preservation of life.

He explained, "just like Darwin," that populations "grow faster than the food supply", resulting in a competitive struggle of animals (including humans) for limited resources. People with better traits will win in the struggle for survival, and he and other Germans should focus on winning this struggle, says Weikart. Hence also the need for expansion, in order to gain living space, so-called Lebensraum, according to the theory[211] of the Darwinian ethnographer F. Ratzel.

In the widely distributed propaganda leaflet "People and Race," which was used in schools and various Nazi organizations (ibid, p. 43), Hitler directly justifies the law-of-nature-means-the-jungle with Darwinism, emphasizing that "the strong must rule and not unite with the weak," and only the weak can consider this cruelty, which is, by the way, the reason why they are weak, "because if this law did not apply, any possible evolution of living beings would be unthinkable," and "struggle is always a means to improve the health and endurance of the species, and therefore the cause of its evolution. Through any other processes, all development and evolution would stop, and the exact opposite process would take place." Many other similar remarks can be found in his speeches, e.g. (ibid, p. 44):

[210] Weikart, *Darwinian Racism*, p. 41
[211] ibid., p. 43

> struggle and thus war is the father of all things. Whoever casts even a glance at nature as it is, will find this principle confirmed as valid for all organisms and for all happenings not only on this earth, but even far beyond it.

In 1927, he scolded pacifists (ibid, p. 45), suggesting that the law of the struggle for survival had completely overthrown their ideas.

> You are the product of this struggle. *If your ancestors had not fought, today you would be an animal.* They did not gain their rights through peaceful debates with wild animals, and later perhaps also with humans, through the comparative adjustment of relations by a pacifist court of arbitration, but rather the earth has been acquired on the basis of the right of the stronger.

That is, Weikart writes, he clearly believes that the struggle for survival produced man from an animal. Another time, quoting almost Haeckel, he points out that there is much less difference between the "lowest" races and a monkey than the "highest" races. Haeckel, Weikart claims, wanted to make the idea of human evolution credible by comparing the so-called "lowest races" to monkeys, and we have already quoted an almost identical argument in Darwin (p. 126). Hitler reverses the argument, drawing support for ruthlessness and racism from Darwinian evolution. Even from the title page of a booklet published in 1943 and 1944 for Christmas, instead of a Christmas tree and a stable[212], there is brutal social Darwinism: "All of nature is a powerful struggle between power and weakness, an eternal victory of the strong over the weak." In summary, it is clear, the author writes (ibid, p. 50), that Hitler adopted Darwinism and Darwinism played a central role in his racist ideology of Aryan superiority and brutal domination. To this conclusion, it is necessary to point out the things we have already mentioned at the beginning: the constant reference to Darwinism made it possible to present Hitler's ideology as scientific and therefore objectively true. Clearly, appealing to emotions and low instincts (hatred, greed, feelings of injustice) is not equally effective. Similarly, referring to historical and national reasons is not effective, because these are

[212] ibid., p. 43

value judgments that everyone can arbitrarily accept or not. Hitler presents war and eugenics as necessary for survival and capable of producing beneficial effects. Either, in fact, the race can be further improved by eliminating the weak, or the race can be seriously harmed if they are allowed to propagate (similar to the opinions of Fisher and other eugenicists). It's a kind of ultimatum and "carrot and stick." Natural selection in Hitler's ideology is the only cause of biological evolution and an unlimited, universal creative force that created not only the world of animals and plants, but also rational man with all the features of body and mind. This is exactly the key ideology that professional materialists preach, and the tyrant borrowed it from them. Hitler, however, adds a simple conclusion: if this is the case, then one should not disturb or even thwart such an important process of nature, which further supported his political plans.

In this way, we see what plan Hitler was able to launch. The supporters of Darwinism in the 19th century can be divided into 3 main currents: one focused on the struggle for recognition (based on meager evidence) of the theory as strictly scientific and the only possible description of biological evolution. The second engaged in eugenics, social Darwinism, and "scientific" racism. The third are militant atheists and modernists who want to eradicate God and Revelation from minds. Adding these currents together, it is relatively easy to weaponize them and obtain Nazism. At least understood as an effective, feasible, and at the same time criminal plan.

Much more can be added to this argument. For instance, most German anthropologists (ibid. p. 65) "employed Darwinian arguments for racial inequality and even Nordic racism", including those "who risen to prominence before the Nazis came to power". Secondly, Nazi propaganda promoting eugenics and killing disabled people includes, as key point, the claim that caring for the affected by hereditary illnesses violates law of struggle for existence (ibid. p. 97), such as in case of movies "Hereditary Ill" and "The Inheritance". Another one, "The Victims of the Past" shared dictum of "science"-savvy pastor Pelle, who remarked that Christian charity needs an update:

> "All life on this earth is a struggle for existence,"

> it proclaimed, and then it continued "everything weak unfailingly perishes in nature. We have *sinned terribly against this law of natural selection* in the last decades. We have not only preserved the life [of the weak], but we have even allowed them to reproduce. All this misery could have been prevented, if we had previously prevented the reproduction of hereditary ill".

Same "Christian" sentiment was endorsed by Konrad Lorenz (Nobel laureate in 1973). As a member of Racial Office in 1940 he expressed profound shocked, that there are men in Nazi education system who reject "evolutionary theory". He could not be bothered to discuss such *obvious* absurdity. Rather, (p. 60)

> the purpose of his essay was to show that evolutionary theory did not sweep away ideals, but rather served as a basis for them. Lorenz vociferously rejected Catholic otherworldly values, but he claimed that evolution provided an even more elevated ideal: the higher evolution of humanity. He further argued that teaching evolution is the best antidote for the Marxist belief in human equality. In his experience, the most committed National Socialists were **those who understood and embraced evolutionary theory**.

No wonder, that Nazi school head great emphasis on the claim that human races (ibid. 54) evolved through elimination and selection. Student was to "accept as self evident this most essential most important natural law of elimination", official handbook says. More on that can be found in Weikart works. M. Flannery of UAB claims that Weikart's story of how "Hitler and the National Socialists operationalized nature red in tooth and claw" will surely shape the future historiography of this era.

No wonder also, that Catholics and especially "ultramontanist-Jesuits" were among chief enemies of new "values", as confirmed by Lorenz and also F. Rossner (ibid.). For that reason, I would like to quote what the jesuit, and well-known biologist Fr. Erich Wasmann SJ wrote about the role of natural selection in the theory of evolution in 1923[213], pointing out that such a role is limited on

[213] Erich Wasmann, *Modern Biology and Theory of Evolution*, p. 260

numerous levels.

> Modern science can hardly be said to take into account Darwin's theory of selection as the exclusive form of the theory of evolution. It is full of weak spots, to which attention was drawn as early as 1874 by Albert Wigand,1 and it is impossible any longer to avoid recognising them. In the first place the theory of selection is in principle not satisfactory, for natural selection may be able to .destroy what is inexpedient, but not to produce what is expedient. Therefore it simply leaves to chance the origin of advantageous modifications, which lead to the formation of new species. A theory based on chance is worthless as affording an explanation of conformity to law in nature. In the second place, most of the variations which serve as the groundwork of classification are biologically indifferent, and do not affect the individual or the species in the struggle for existence ; they can therefore not be due to natural selection in their breeding, because they present no points d'appui on which it can work. In the third place, in order to account for the formation of one new species, this theory requires innumerable, almost imperceptible variations to have existed for immense periods of time and to have been gradually accumulating and intensifying. This contradicts known facts of palaeontology, for the Fauna and Flora of remote ages display a definite system of classes, orders, families, genera and species, just as do those of the present day, and not a chaos of imperceptibly slight variations, such as the theory of selection requires.

That chance is worthless as explanation, is related main principle of this book: that explanation consists in order and coordination for determined effects. If all effects are indifferent to an explanation (such as when they are random), then it is not genuine explanation. Similar argument was used by Einstein against Copenhagen interpretation of quantum mechanics: that to postulate randomness is same as stating incompleteness of the model[214].

[214] Einstein, "Reply to Criticisms in Albert Einstein: Philosopher-Scientist"

The point of view presented by Fr. Wassman and is consistent with the scientific facts of that period, as well as consistent with the state of modern knowledge, particularly modern revisions of Darwinist theory, going by the name of Extended Evolutionary Synthesis[215]. The author protests especially harshly against the application of Darwinism to man, saying that "maintaining such a doctrine in the name of science is worse than deception, it is a serious offense against the highest achievements of humanity," and that materialists falsely equate Darwinism in the first sense and the second sense, as well as equate the theory of biological evolution with Darwinism as if it were the only theory of evolution.

It is clear that if voices like Fr. Wasmann's had been listened to, Hitler and his ilk would not have had ideological ammunition for their doctrine, supporting it with fake science. It is also clear that terrible conflagration of World War II came from a century of philosophical and scientific superstition. Final cause philosophy, being foundational of Catholic metaphysics, antropology and ethics clashed in this fight with professional atheism and modernism, as well as elitist "conservative" elements. Had the reason won this fight, millions of lives would have been saved. However, it did not, which brings to our attention the matter of responsibility for spreading such ideas, recognized in part by Nurnberg Trials of 1949.

And those intellectuals who still promote such a simplistic version of Darwinism, based solely on natural selection, denigrate final causality as nonsense, and posit a near-equality between humans and apes, deserve to be asked one simple question. It's not even about the many outrageous problems with their claims. No. The more important question is: how can you blame me for not believing in your "theory" if your own conviction is only at a level of 4 out of 10? You no longer call for a full-scale application of Darwinism, but instead, you make an u-turn and whine that Darwinism now supports altruism and cooperation. Really? It's a pity we did not hear that prior to 1945.

[215] see summary in Koonin, *The Logic of Chance*, p. 399

Quid retribuam Domino pro omnibus quæ retribuit mihi?

In the memory of ancestors, especially Władysław Mikołajczuk and Bernard Zawistowski, with thanks for what is important.

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