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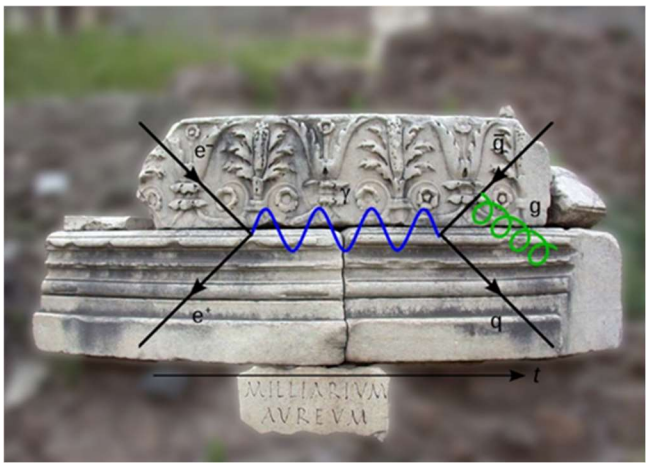
Omnes Viae Romam Ducunt - All Roads Lead to Rome
The sum of all possible realities is the true reality

Contemporary thoughts on a socio-political physics by Rainer Ibowski



We like to say that all roads lead to Rome when we want to express that there is not only one way to the desired goal. It is not the path but the result that is important. The saying probably goes back to the Milliarium Aureum, a bronze column that Emperor Augustus had erected in the Roman Forum in Rome in 20 BC. On this column were the names of all the capitals of the provinces of the Roman Empire with their respective distances from Rome. Augustus laid out an extensive network of roads in his Imperium Romanum that led from Rome into the entire empire.

Let us make a leap in time of 1700 years to Gottfried Wilhelm Leibniz, a German philosopher and mathematician of the early Enlightenment, who lived from 1646 to 1716. The universal spirit of his time sees our world as the best of all possible worlds. And Leibniz introduces a symbolic notation of integrals, an elongated S for sum, a ∫. As part of the infinitesimal calculus, integrals can be used to calculate a number of physical phenomena, among other things.

This leads another 300 years later to the so-called path integrals, with which the physicist and Nobel Prize winner Richard P. Feynman successfully describes the reactions of elementary particles. According to this, the result of a collision of such particles, for example, is nothing other than the sum, or more precisely the integral, of all probabilities of the infinite number of possibilities of all interactions. This amazingly simple description is confirmed in many experiments. However, it has a catch. An exact mathematical calculation of these path integrals is practically impossible. It requires some mathematical and physical "tricks" to arrive at a result.

So far, so good! But what do we learn from all this knowledge for ourselves, for our lives, for our world, for our universe?

Let's take a look back at school physics. Perhaps some of you remember the double-slit experiment in optics. In a simple experimental setup, a point source of light shines through two narrow slits in an otherwise opaque metal plate. On a screen behind it, you don't see a faint spot of light because a large part of the light is shielded, but a fringe pattern, a kind of wave pattern we know from water surfaces, on which waves overlap. The explanation of the phenomenon is the beginning of a fundamental shake-up of the physical world view. The individual light particle

did not take a well-defined path through one of the slits. Rather, it passed through both the right and the left slit with a certain probability, in this simple case of 50 percent. The surprising result: light sometimes behaves like a stream of particles, sometimes like a wave. If the physics teacher wants to make it even more interesting, he increases the number of slits. The wave pattern becomes more complex. The groundbreaking understanding of the dualism of wave and particle is soon proven for other particles as well.

A few decades later, after many more experiments and theories, we stand fascinated before the results of quantum physics. At the pub, it can be summed up simply as follows: "Nothing is known for certain." More factually, it should be: "We live in a world that is described by probabilities." In 1926, the Austrian physicist Erwin Schrödinger formulated an equation that won him the Nobel Prize. The Schrödinger equation describes a system and its dependence on time through a wave function. For example, the location of a particle is no longer precisely defined, but we can only specify a certain probability of finding this particle at a certain location.

This understanding applies to our entire universe. We are all waves and particles at the same time. Our actions are based on probabilities. However, with one important framework condition. The smaller my observation world is, the more important the description by quantum physics is. Describing a macroscopic object as a wave makes little sense. Classical physics is quite sufficient. Or perhaps not? Besides the scientific insight, there remains a philosophical pensiveness.

Let's go back to the double slit experiment. If we increase the number of slits more and more, the stripe pattern becomes more and more blurred. We can hardly resolve a wave pattern any more. Let's take it to the extreme. We let the light shine through an infinite number of slits. Now a single spot of light appears on the screen. "What else," I hear accusingly, "because an infinite number of slits means nothing other than removing the metal plate." But is the cone of light from a torch in a dark room actually real?

My thought experiment leads in another direction. Even with an infinite number of slits, i.e. practically without any obstacle, the light particles still have various ways of getting to the screen. Some paths there are very improbable, others are particularly probable. Mental conclusion: the light spot on the screen, the light cone of the torch in the dark room, is the sum of all possible paths that a light particle can take from the source to the screen. What we believe to be reality is therefore merely a sum or, better, an integral of all probabilities. True reality does not exist. Everything is only the most probable reality.

This brings me back to Leibniz, but with a difference. Leibniz sees in the best of all possible worlds the selection by a wise divine being. Let us leave it unanswered whether a wise God or laws of nature determine our perceived reality. In any case, we must accept that our being is, in Feynman's sense, a path integral of all probabilities of existence.

A large majority of cosmologists see the formation of our universe in this way. In the first fractions of seconds after the Big Bang, there are random irregularities from which our known universe develops millions of years later. Planets, stars and galaxies are products of a coincidence that occurred with a certain probability. Without these "coincidences" in perfect uniformity, our universe would be dark and empty, indeed, there would be no living being to ask the question why. We and everything around us are only one reality of many. Are we also the best of all probabilities?

From a purely cosmological point of view, the answer is relatively simple. Of course, a multitude of universes are conceivable in which coincidences could have led to a different development, in which other laws of nature prevail. We simply live in one in which, for example, natural constants are exactly right, so that matter and life could come into being. The fine structure constant is often cited as proof of this, a physical constant that indicates the strength of the electromagnetic interaction. Its value is pretty much 1/137. If there were only a minimal deviation from it, there would be no atoms and molecules, there would be no life.

Of course, we claim that we are the best selection from all probable possibilities, the speck of light on the screen, so to speak. We should not be surprised by this presumption, since we are part of this selection from all possibilities. We lack the yardstick with which we can measure the best.

To see our own life as a selection determined by natural law from all probable possibilities sounds damn fatalistic. From the point of view of a fatalist, the fate is inevitable. Characteristic of fatalism is the assumption of a universally logical inevitability that determines the course of history as well as individual destinies. This results in the equation of the possible with the actual, precisely the erroneous assumption that there is a true reality.

Fatalism, however, does not necessarily mean being at the mercy of fate. A person's will can certainly oppose the indeterminable choice of all possibilities. To remain in the image of the double-slit experiment, man can determine the goal of the best possible selection of all paths, the screen. Without determining a goal, the paths to it are meaningless and pointless. A ray of light into the void illuminates nothing.

Thus, after our mental excursion into the world of path integrals, we are once again in front of the Augustinian bronze column in the Roman Forum, which not only points out the paths, but also names the destinations. Detours and deviations are possible as long as the rough direction is right. Anyone old enough to remember their scouting days knows this. Hiking with a compass through impassable terrain requires intermediate destinations, randomly determined distinctive points in the terrain, the selection of which has no influence on the destination, at most making it easier or more difficult to reach.

Omnes Viae Romam Ducunt should of course also apply to our human community, to our society. It is not the individual political current that is important, but the goal of the current. I fight for a "target screen" where everyone meets despite different paths: a globally connected humanity that fully accepts the dignity of each individual, and a liberal order in social and material equality of all individuals.

However, my view of the political world stage makes me strongly doubt that we are pursuing a common goal. Russian state terrorism under Putin, pseudo-socialist state capitalism under China's Jinping, the narcissistic conspiracy mania of Trumpism, and European small-state discord are such stark departures from a best possible path to the goal that they would go completely unnoticed in a physical system. In the real world, however, they are incendiary. Waves can cancel each other out.

My view of political Berlin even makes me almost despair. The tradition-rich SPD is watering down its goals with platitudes and allowing compromises for the mere sake of staying in power. The CDU and CSU include "Christian" in their party name, marginalise minorities and draw no red lines to racists like Maaßen. The Greens have traded their fundamentalism for state support, which makes their original goals a distant memory. The AfD is the rallying point for fascists, far-right, racist and xenophobic, far from a new human world order.

And the FDP, this appendix of the party landscape? The so-called liberals have not yet grasped at all that we are in the 21st century. They are still the "dentist's party" (the medical profession may excuse my choice of words) that they were fifty years ago, with the aim of making the wealthy middle class even wealthier and the rich even richer. Liberal freedom for them means no speed limit on the motorway. Rather more road deaths and environmental damage. If it helps to make them disappear even further into insignificance, then we should let the Holstein old-blooded Kubicki continue to grab boobs in hotel bars and let the upper-liberal Lindner bleach his fine-ribbed underwear and his presumed liberalism. Oh, by the way, Kubicki is one of the most vocal campaigners for the gambling industry, which some believe is mafia-infused.

Immanuel Kant, one of the world's most famous born in Königsberg in 1724, also quibbles with terms like actual and real in his treatise on the Critique of Reason. Influenced by Leibniz, he concludes that cognition is always dependent on the object. Reality is the appearances in space and time. The fact that we cannot imagine objects without space and time is, according to Kant, due to our limitedness and not in the objects themselves. We cannot know whether space and time exist in things in themselves.

Thoughts on truth and reality are not new. Aristotle, the Greek philosopher born in 384 B.C. and a student of Plato, states that "to probability [also] belongs that the improbable occurs."

Unfortunately, Aristotle is right. In recent years, we have seen again that what was thought to be improbable comes to pass. The brutal invasion of Ukraine by Russia is a cautionary example. But this is only the beginning. It is no longer improbable that we will experience a climate apocalypse in a few decades. We see the cause solely in the unsuccessful limitation of using fossil fuels. Behind this climatological reason, however, lies a much deeper symptom. "While millions of people do not know how to pay for food and energy, the crises of our time are bringing gigantic increases in wealth for billionaires," Oxfam, one of the world's largest relief and development organisations, states ahead of this year's World Economic Conference in Davos. The super-rich must "finally make their fair contribution to the common good." What's more, the emissions that billionaires cause through their own consumption with private jets, super yachts and luxury villas amount to thousands of times the global per capita emissions.

Under these circumstances, who can blame the billions of disadvantaged people, especially in the global South, for not accepting a renunciation of participation? If we create a social balance and close the gap between rich and poor, we will probably take care of our climate more effectively instead of discussing wind power and coal in a continuous loop. Maybe then even a Lindner will understand that his concern for the automobile industry is actually his concern about wealth increases for rich shareholders.

My basic assumption, uninfluenced by all the party wrangling*), is that in the long term the most probable and best possible alternative will emerge from the multitude of all probabilities for the development of our planet. I am an optimist. The pessimist in me - or the fatalist - whispers in my ear that the best possible of all worlds could possibly be a world without humans. In the path integral from now to the future, humans are probably a side path that is meaningless for the result.

Richard P. Feynman leaves us with the following important guidance. "We absolutely must leave room for doubt. Otherwise there is no progress, no learning."

*) The hiccup over capping energy costs is exemplary. Capping my electricity price saves me nine Euros a month. Nevertheless, my monthly down payment has risen from 96 Euros to 169 Euros. Without the "huge" savings, it would have been 178 Euros. In other words, I'm still paying 76 per cent more than before the Ukrainian war. Shouldn't many in Berlin be ashamed of themselves?

Illustrations: Remains of the Augustinian bronze column on the Roman Forum superimposed on a Feynman diagram (both public domain). The diagram illustrates the path integral when an electron and a positron annihilate in a collision. The result is a quark-antiquark pair and a gluon.
Painting "Future" by the author.