Relativity, Determinism and the “Monistic” Conception of the World

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> *‘At small scales, matter behaves very differently than at large scales. So we ask: at small scales, what is comparable to gravitation? As yet, there is no quantum theory of gravitation. [But] I would like to emphasise the common features between the law of gravitation and other laws. Firstly, its expression is mathematical, as with others; secondly, it is not exact, which is true of all the laws we know. It may be that this is a property of nature, which only uses its longest threads to weave its patterns. Consequently, each of its smallest parts reveals the structure of the whole tapestry.’*
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> *- The law of Gravity; Richard Feynman*

In 2005, the theory of relativity turns one hundred years old, and fifty years have passed since the death of its greatest creator in 1955. Amadeo Bordiga wrote a small essay on that occasion, Relativity and Determinism, in death of Albert Einstein. We would like to recall it briefly here precisely because it deals with the boundary between today's knowledge and that of the future, freed from bourgeois ideology.

Arrested by the fascist police, Bordiga had studied the theory of relativity in 1926, in prison in Palermo, while in transit for his future confinement in Ustica. After the Second World War, he had taken up physics issues as part of a general work on the theory of knowledge, arguing decisively for an anti-dualist conception of the continuum in science. He thus stood against the ‘Copenhagen School’, based on wave-particle dualism, whose metaphysics was described by some of his followers as a ‘return to Aristotle’.

For communists, it is crucial to defend the unitary conception of the world against the fragmentary conception of specialised reductionism because it has consequences for the social conception. Indeed, there can be no contradiction between the laws that govern the physical and social worlds, because the social world too is nature, matter that differs from the mineral and plant worlds only in that it is organised differently. This does not mean that reductionism in itself is to be rejected: no biologist today, for example, could ignore the study of living matter from the molecules that compose it. Marx himself had to reduce capitalist social complexity to simple, abstract categories such as labour-power and value. But it is precisely because of the contradictions to which today's science has reached that many scientists are asking the realistic question of whether a set of simple laws, a unifying theory underpinning all physics, exists - and therefore

needs to be sought. Some of them extend this need for unification to every branch of knowledge related to the phenomena that we are now accustomed to seeing grouped under the name of ‘complexity’.

The basic proposition of determinism, first expressed by Laplace as the bourgeois revolution stabilised is well known: given the position and motion of all the particles in the Universe at a given instant, their position at any subsequent instant in time will also be given. The proposition, to be valid, had to postulate an infinite capacity for knowledge that could fix the state of the system and determine its evolution. Since this intelligence did not exist, it would not have been possible to know either the starting conditions or the subsequent conditions, but this would not have implied a falsehood of the deterministic statement. The school of quantum indeterminism, on the other hand, had declared it false in principle.

The bourgeoisie had moved from its revolutionary to its conservative, and then reactionary phase by abandoning its own certainties. Regardless of the fact that Laplace had introduced an infinity (which in science is always an indication of something unresolved), it gradually repudiated what it called ‘reductionist mechanism’ to the point of reintroducing, at the beginning of the 20th century, the ancient philosophical forms of doubt, of the dichotomies between object and subject, between reality and experience, between man who knows by expressing ideas and nature that would act as an impassive material background. Thus, at the birth of particle mechanics, to which Einstein himself had made an important contribution, there were already the preconditions for an anti-deterministic theory that soon became philosophy, which was a winner on all fronts due to the great empirical results obtained. Einstein disagreed with this approach and searched his whole life for a unifying solution without being able to find it.

The reasoning on which he based his research was exquisitely ‘monistic’, as is written in Bordiga's article. Physical laws are valid in every place and time, on Earth and in the remotest corner of the Universe, a million years ago and a million years from now. There is no way, based on current knowledge, to assume anything different. Science today rejects a world of variable laws. Without some principle of invariance, which in this case physicists call symmetry, it would even deny itself. Einstein argued at great length that there could be no dichotomy between the laws of the macroscopic, deterministic world and those of the microscopic, supposedly indeterministic world. For the simple reason that they are not two distinct universes: the former is made of the latter.

At the time of Einstein's death, the controversy was still strong and the ‘philosophical’ issues carried a lot of weight, so much so that an American physicist fell victim to McCarthyism and lost his job for advocating a deterministic model with hidden variables. Today, there is a tendency to downplay the importance of our imperfect knowledge of matter; theories are

used as they are, reaping the benefits without concern for a coherent understanding of the underlying laws. Most physicists no longer metaphysically interpret the uncertainty principle, they simply see it as the impossibility of knowing at the same time the position and momentum of particles within a system that is in any case considered entirely deterministic. After all, beyond the supposed wave-particle dualism, even in the macroscopic world, a kind of indeterminacy applies: for example, I cannot measure my speed with a precision greater than my reaction time in pressing the stopwatch button.

Having set aside the philosophical stumbling block, however, the question remains open: the theory of the continuous (relativity) is still incompatible with that of the discrete (quantum mechanics). In both, calculations lead to infinities which, as we have seen, are indicative of error. Although each is of great power in its own field, they cannot coexist: either one is wrong, or both are wrong, since, as incompatible, they cannot both be correct.

Bordiga does not opt for one theory against the other. He recognises in that of relativity - within the limits admitted by Einstein himself - a connection with the Marxist theory of knowledge. But he also recognises the acute solutions of quantum mechanics, of which he only rejects the philosophical claim to translate matter into an idea of matter. Above all, he reiterates that, behind the apparent coldness of formulas and enunciations, Einstein blew up forever the world of dualism between matter and energy, between matter and spirit, between body and thought. It placed him in the same school that helped to strengthen our unitary, monistic conception of species and not of individual genius; that contributed to the emergence of a new theory of knowledge, latent today, waiting for the revolution to free it completely.

As the physicist Richard Feynman said, it is no big deal if we do not know what the theory of relativity is in ordinary situations. But…

> *'... our whole conception of the world must be changed when we know that mass changes even slightly as velocity changes. This is the true peculiarity of the ideas behind the laws. Even a tiny fact sometimes requires a profound change in our thinking.'*
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> *- The Feynman Lectures; Richard Feynman*