The dialectics of nature: historical blunder or heuristic view?

(Draft translation)

The text below is a translation of a talk given by Lucien Sève to the colloquium Friedrich Engels, Scholar and Revolutionary, held at the University of Paris – X Nanterre from the 17th to the 21st October 1995. The proceedings were published in Friedrich Engels, Savant et Révolutionnaire, edited by Georges Labica and Mireille Delbraccio, published by PUF 1997

(All footnotes and sub-heads have been added by the translator)

Although Engels' idea of a dialectics of nature was taken very seriously by many scientists between the wars, including some of the greatest from Niels Bohr to Paul Langevin, and also by philosophers of science from Bachelard to Gonseth it was later disqualified during the cold war by the fantastic aberrations of the Stalinist Diamat culminating in the Lyskenko affair. Today it seems to have been abandoned to the “gnawing criticism of the mice”. Is there any point in reviving it? That is the question I propose to deal with here.

1. On the status of the dialectics of nature

What sort of discourse can be based on a dialectics of nature? For those who read Engels somewhat rapidly – i.e. the Dialectics of Nature (DN), some chapters of Anti-Dühring (A-D) and passages in Ludwig Feuerbach or from correspondence on the same subject – the response seems unequivocal: this dialectic, he tells us, is a science (Wissenschaft) proposing its own Laws (Gesetze): those of the transition from quantity to quality and inversely, the interpenetration of opposites, the negation of the negation. These are for him “the most general laws” (DN, p.63) of all “movement” (A-D, p.505), of all “connection” (DN, p.505), of all “development” (DN, p.64) – three rather different terms to which I will return – laws valid at one and the same time for nature, history and thought. In summary, these would be the universal laws of matter. Now, this assertion destroys itself dialectically since such universal laws could not but be those of a matter which is itself universal, in other words totally abstract. As Engels wrote with good reason elsewhere that “matter as such”, taken at at the most abstract possible level, “has no sensible existence”, “it is a pure creation of thought” (A-D, p.517). Can it be from this pure abstraction that the concrete essence of the laws of dialectics are formulated? Laws which allow for the diverse forms of matter concretely existing clearly cannot be anything but relative and particular. Can the idea of universal and absolute dialectical laws of matter in general be anything other than the most far fetched metaphysics?

There have been many attempts to rescue Engels' claims by pointing out that this dialectical Wissenschaft was not so much a science, properly speaking, than rational knowledge, for which the Gesetze would be instead principles, like those for example of sufficient reason – in other words by maintaining their generality at the price of a weakening of their scientificity. But Engels did not understand things this way. Dialectical laws, he insists, “are true laws of development of nature” (DN, p.64) which “merely reflect” (DN, p.214) its actual movement. The laws are not produced by a priori construction to then be imposed on the facts but “discovered starting out from them” (A-D, p.460?), “confirmed by experience” (DN, p.49) and thereby “demonstrated” (DN, p.174). Seeming strangely unaware of the savage criticisms with respect to induction, examples are multiplied in Anti-Duhring of qualitative leaps in order to the conclusions that we can “In order to prove this law we might have cited hundreds of other similar facts from nature as well as from human society” (A-D, p.XX). No evasion seems possible: what Engels wants us to accept is that dialectics is a super science of matter in general – including thought – for which categorical knowledge inspired by Hegel would be acquired and guaranteed by a thoroughly empirical approach. In this scientistic form, the dialectics of nature, critically confuses different levels of theoretical propositions, seems beyond doubt to be a regrettable blunder by Engels. This has often resulted in placing philosophy at the level of Spencer rather than at that of Marx, posthumously giving him a partial responsibility for the Lysenko affair.

The fate of the dialectics of nature as thus understood is often said to show that it is totally sterile. In my view this is contrary to the truth of the matter: nothing is more prolific. And, something which should also
give rise to reflection, it doesn’t only produce monsters. Thus Engels showed on more than one occasion, with his dialectics, an indisputable critical clairvoyance of things to come, from precise issues such as that of the alleged permanent gases – at absolute zero, he foresaw correctly, that all gases would necessarily condense – right up to problems of vast general significance such as that posed by the second law of thermodynamics. The growth of entropy, he argued, unless it contradicts the fundamental principle according to which energy can neither be destroyed or created ex nihilo, must go along with processes which operate in a qualitatively opposed sense. This is the rich line of research followed in our own time by Prigogine with his work on the entropy of dissipative structures. But it is precisely because this dialectic is so prolific that it can also prove to be catastrophic: it takes the right to adjudicate on truth and falsity on the basis of the congruence or not with its laws which are taken as a superior essence, and to this one can add in all too many cases both arrogance and incompetence. It was in this manner that Hegel believe that he had established the non-existence of the Ceres asteroid just before it was actually observed. On this approach, in any case, the dialectics of nature is dead, and we must, above all, not try to revive it.

With a more attentive re-reading of Engels, however, a very different conception appears and it is in direct contradiction to the one just described: to conceive nature dialectically is, first and foremost, to free oneself once and for all from henceforth untenable metaphysical concepts with their fixed and separate categories. Everywhere the opposition of contraries is found to be relative, demarcation lines fade away, and the duck-billed platipus lays eggs like a bird and feeds its young like a mammal. In this sense, the dialectics of nature only indicates what is by revealing what is not, even when it concerns inorganic nature, “identity as such is in reality non-existent” (DN, p.217.). Here the dialectics of nature is no longer immediate knowledge of the real but rather a reflexive critique of its received representation. It “presupposes investigation of the nature of concepts themselves” (DN, p.226). Faced with the physics of Mayer, the chemistry of Mendeleev and the biology of Darwin, “thinking is necessary: atoms and molecules, etc., cannot be observed under a microscope, but only by the process of thought” (DN p.208). And the study of forms of thought sends us of necessity from science to philosophy. That is why one finds among the philosophers ultra-profound theoretical views that challenge scientists “even in their own special sphere” (DN p.208.). It was Leibniz who began the mathematical study of infinity, Kant who inaugurated the concept of an evolving universe, and Hegel who demolished the vacuity of the concept of force and the absurdity of an attraction with no repulsion. If the dialectics of nature can be fertile for empirical knowledge, it is because it provides a much stronger elaboration of their rational form, in other words of the “logical categories”.

From this perspective, dialectics no longer has the status of a science declaring laws but of a logic working on the categories in order to produce, in relation to classical logic, the analogue of the relation between higher mathematics to elementary mathematics. This would be in no way a formal logic, that is to say “a mere proof-producing instrument” (A-D p.185) – nothing has been proved when one says of a natural process that it has the form of a negation of the negation, as Engels emphasis at length in Anti-Dühring –, but rather a substantial logic, if I can put it that way, where the determination of the form of movement of content are inseparable. There is no doubt that this takes us closer to a thinkable status for the dialectics of nature. And this is a position which has often been illustrated and defended by Marxists such as Henri Lefebvre (in his Formal Logic and Dialectical Logic). Nevertheless this position has has in our times been subjected to a sustained destructive critique, such as that developed by Gilles-Gaston Granger in his recent book Formes opérations objets (FOO).

Logic, Granger says, has progressed so much since Hegel that we can no longer give the term the meaning of a much too vague “general theory of Logos” (FOO, p.106). The only rigorous understanding of the work must be strictly formal. Only such a logic will allow inference, properly understood, in other words “the necessary and unequivocal passage from one proposition to another”. What gives rise to the apparent

1 Translated from the French translation of the German original. The English translation of the German differs from somewhat from the French one. The relevant part of a very long sentence from DN in French is “Mais, comme, sans pensée, ils ne progressent pas d’un pas et que, pour penser, ils ont besoin de catégories logique, comme, d’autre part, ils prennent ces catégories, sans en faire la critique, soit dans la conscience commun des gens soi-disant cultivé, conscience qui est dominée par des restes de philosophies depuis longtemps permi...” (Emphasis added). The English translation of the same passage is “They [the natural scientists] cannot make headway without thought, and for thought they need thought determinations. But they take these categories unreflectingly from the common consciousness of so-called educated persons, which is dominated by the relics of long obsolete philosophies ...” (DN p.213, Emphasis added).
fertility of a dialectics of nature is that it works, on the contrary, with “empirical content more or less bound up with contingency” (FOO p.49) That is why one can never give its concepts a genuinely unequivocal meaning and also why no certain inferences can be drawn from them. If the project of a dialectic is to remain possible it can only be with the status of “a strategy for objective knowledge” for which the maxims loose all sense if they are detached from their field of effective application. Conclusion: “thought deceives itself if it claims a power to create objects which result from a formal content” (FOO, p.52). In my view there is much that one could discuss regarding this local restriction of the legitimate uses of “a strategy for objective knowledge), but is it possible to disagree with Granger regarding the untenable equivocation that is involved with speaking of dialectics as a “logic”?

If it is neither an effective science nor a true logic where are we to look for the elusive status of a dialectic of nature? In Engels’ texts one can find the elements for a third approach through which the profound meaning of his undertaking can be re-captured. “Natural science, like philosophy, has hitherto entirely neglected the influence of men’s activity on their thought; both know only nature on the one hand and thought on the other. But it is precisely the alteration of nature by men, not solely nature as such, which is the most essential an immediate basis of human thought” (DN, p.234). Thus the category of causality has as it basis our productive activity. All our categories carry the mark of historically determined modes of production. This understanding is characteristic of what Gramsci called the philosophy of praxis. It leads us to recognise the central importance of the long exposition in the Dialectics of Nature entitled “The part played by labour in the transition from ape to man”. The project of understanding nature dialectically, that is to say, as transforming itself continuously, cannot be separated from the project to transform the project of transforming our natural pre-history into a truly human history. This is not a doubtful digression beyond historical materialism but rather an integral part of “the communist world outlook”. (A-D p.14). The metaphysical representation of the world is all of a piece with the instrumentalisation of nature by capital. Its dialectical representation is a cultural preparation for the transition to a disalienated social form of the relations of men with nature and between men themselves.

In this third version, no more than sketched here, the dialectics of nature shows itself to be a theoretico-practice of the transformation of nature which is not presented as separate from history. And there, without doubt, we touch, in effect, one of the most intimate dimensions of his project. But it is necessary to appreciate the price that is liable to be paid for this deeper reading. It will only rescue Engels’ reflection by reinserting it in the dialecticity of human action. Let us pose the question in all its materialist sharpness: yes or no, was nature dialectical before man? This leads to a line of questioning which one cannot avoid. Engels doesn’t avoid it. He replies categorically yes. It is this yes which has never ceased to pose problems because it is nearly always understood – including in the relapses of Engels himself – as the direct attribution to nature of dialectics which even the word tells us is intrinsically bound up with human discourse. There is a very good reason why the great idealists from Plato to Hegel were idealists – the reason being that dialectics is created and recreated from the work of reason and on reason – they worked from the starting point of the idea. How can one transfer this subjective dialectics to nature without failing into anthropomorphic foolishness?

I would like to conclude on this first point by at least suggesting that the difficulty just noted cannot be removed except on condition of being coherent right to the end regarding the materialist reversal [of idealist dialectics - Tr]: if subjective dialectics can make pertinent contributions to objective knowledge not only of history but also of nature, it is because it was formed on the basis of both history and nature of objective presuppositions of dialectical knowledge. There we find the powerful truth of the Hegelian theme according to which mechanics, chemistry and biology are objective moments in the genesis of concepts. Of course, we must disentangle this Hegelian theme from its idealist adherents, liberate it from all traces of teleology and all deductivist temptations. The later are still there in Engels, and an immense field of work opens up before us to go further than him in the work of critical elaboration in relation to today’s knowledge. But it is not an illusion that, for example, nature has produced by itself exchange particles such as bosons, the genome of living species, the large brain of the higher vertebrates, all being qualitatively new.

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2 The neologism “dialecticité” was introduced by Sève “I use the neologism dialecticity in order to express this real objectivity of dialectical relations and processes which however owe to our mental subjectivity their expression in dialectical forms. Rigorously speaking, there are no more dialectical contradictions in nature than there are numerical relations, topological properties, causal sequences or all sorts of other rational elaborations by means of which they are known through our production of knowledge”. (“La Philosophie”, La Dispute, 2014, p.567)
and where one find the substance of identity in difference, the internal in the external, the universal in the particular. Paraphrasing Marx, I would say that the dialectic has always existed even though in an adialectical form which thought has as its task to understand dialectically. That, in my view, is the authentically rational kernel of the Engelsian dialectics of nature.

2. On the content of a dialectics of nature

If the status of a dialectics of nature remains today such an open question what can we say about its content? Neglected by the great majority of scientists, deserted by most philosophers, this second question has been left unconsidered for nearly half century. A half century during which the developments in scientific and mathematical thought have accumulated materials of an intriguing richness for dialectical analysis. In the epoch of the theory of fractals or of complexity, the efforts to unify fundamental physical interactions or to understand the biochemistry of morphogenesis, is it possible to imagine that there is nothing else to say about the content of this dialectic that what Engels already knew a hundred years ago? And even according to himself Engels had not added much to what Hegel already said at the beginning of the nineteenth century. The truth of the matter, in my view, is that there are few theoretical fields which have undergone such fundamental upheavals. In the ten minutes which I have left I will limit myself to sketching one of the problem areas, which I think is among the most central, that is offering itself as a challenge to our perplexity. It is the one which is hidden behind Engels' hesitations regarding the definition of the dialectic as the study of the most general forms of connection and of development.

To do this I need first to take a step backwards. With Hegel – to put things in a very simplified way, given that the dialectics of the philosophy of history is not at all the same as that of the Science of Logic which I am here taking as my reference – contradictions are always based on the identity of opposites and always move towards the conservation of both in a unity which supersedes them: contradictions are essentially reconcilable. It is on this point that, after 1843, Marx carried out a simultaneous a reversal of the Hegelian dialectic. He saw that it is necessary to start not from the movement of the idea but from that of real history and that this required a critical re-elaboration of its rational kernel. Between opposed classes there is a unity but not an identity, one of them cannot emancipate itself completely without abolishing the other. This contradiction is irreconcilable. This irreconcilable material contradiction, foreign to Hegel's thought because of his idealism, was given a new name by Marx: antagonism, a categorical form of real development. He believed that by through this idea he had closed his dialectical account with Hegel. But, in the 1850s, he engaged in a very close study of the capitalist economy focussed particularly on its functioning. And here he found that at each step he was dealing with contradictions which seemed to be altogether Hegelian. For example between sale and purchase there is a clear example of the identity of opposites, and their mutual opposition is reconcilable in the framework of non-commodity exchange. What Marx encountered at this point, without explicitly analysing it, was the opposite of antagonism: non-antagonistic contradiction, as it was named by Mao Zedong. We can understands therefore better why, on returning to Hegel's Science of Logic from the beginning of 1858, Marx discovered and major formal support for thinking about the functioning of commodities and money.

This was a remarkable moment: it is also when Engels told Marx for the first time about the ideas running through his head about the natural sciences (in a letter of 14 July 1858). Engels wrote “By the way, do send me Hegel's Philosophy of Nature as you promised”. This is a striking illustration of Engels' initial views of on this matter. So just what was the issue in this reading of July 1858? Firstly, the discovery of the cell by Schleiden and Swan. Engels wrote, “Everything is a cell. The cell is Hegel's "being-in-itself and during its development it undergoes exactly the Hegelian process resulting finally in the 'idea', i.e. the particular complete organism.” Then he commented on the reciprocal conversion of all physical forces. He write “But is this not a splendid material proof of the say in which the determinations of reflection are resolved into one another”. Finally, on the structural concordance of the fundamental traits of all vertebrates, man included, and even, in a looser manner, among the insects also, even flat worms. Engels comments “Here too Hegel's stuff about the qualitative leap in the quantitative sequence fits in very nicely.”

Is this not sufficiently clear? What strikes and motivates Engels in the great advances of the natural sciences which he knew about in 1858, is that highlighting the interpenetration and reciprocal transformation of

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3 In his pamphlet On Contradiction published in 1937.
opposite, the identity of differences throughout their qualitative distribution. It is the omnipresence of a dialectic which is spread out in space where there is a juxtaposition of complementary forms which function in the reversible time of cyclic process. In a word, it is the Hegelian matrix of reconcilable contradictions. There, if I am not mistaken, we have the definition of the dialectics of nature provided by universal “connexion”: a representation of nature where, in opposition to the irreconcilable class antagonism, there is a central space for “cooperation” (DN, p.312) and the “mediation of opposites” (DN, p.216), the “just as much this as that” rather than the unconditional “either this or that”. Thus, just when Marx unexpectedly rediscovered inspiration in Hegel to help him elaborate the non-antagonistic contradictions of economic functioning, and it was this same dialectic of non-antagonism, directly nourished from Hegel, which provided an initial content for the Engelsian dialectic of nature.

However, the next year saw the appearance of *The Origin of Species*. This was a major scientific shock for both Engels and Marx. It was also a philosophical shock. For here it was clearly a matter of the creative and unpredictable transformative evolution of species and not a simple embryological deployment of a form determined in advance – and it is there that we find the basis of Hegel’s concept of “development” which is more genetic than historic. Engels wrote to Marx in December 1859 “Darwin, by the way, whom I’m reading just now, is absolutely splendid. There was one aspect of teleology that had yet to be demolished, and that has now been done. Never before has so grandiose an attempt been made to demonstrate historical evolution in Nature, and certainly never to such good effect”. Now antagonism came to the fore in nature itself. Marx wrote to Lassalle in January 1861 “Darwin’s work is most important and suits my purpose in that it provides a basis in natural science for the historical class struggle.” In this way the very serious limits of Hegel reappeared equally in his capacity as a dialectician of nature. “In Hegel’s system”, wrote Engels, “any development was excluded from the temporal history of nature”. (DN, p.241). Engels argued that Hegel could not see “succession” but only “juxtaposition”. He said “Hegel fell far behind Kant, whose nebular theory had already indicated the origin of the solar system” (A-D, p.19). With Darwin, and those who followed him, there was an entirely new content, no longer just repetitive but authentically evolutionary leading to an irruption in the dialectics of nature. This new content which gave meaning to this different definition: “Dialectics, however, is nothing more than the science of the general laws of motion and development of nature, human society and thought”. (A-D, p.194).

We thus see two different definitions cohabiting in Engels view of the dialectics of nature, two distinct categorical contents despite their apparent identity – that of a closed functioning and that of open development. There is, or course, nothing illegitimate about that to the extent that nature consists both of repetitive processes and invariance and also of evolution. But what creates a real problem is that the differences between these two sorts of dialectic are not clearly seen by Engels. He sees only their unity so that the polar forms of contradiction are not analysed as such. The result is an disturbing confusion in which thoughts about irreversible developments remain enclosed within a dialectic of eternal repetition and, on the other hand, the invariance of the laws of conservation tend to dissolve into universal transformation. Beyond that we have the terrible damage of the Lyssenko affair and others that accompanied it with less noise. Is this not a profound reason for the massive disaffection of scientists with regard to the dialectics of nature?

### 3. Clearing the confusion

This confusion resulted in a view that was insufficiently detached from the teleology of cyclic processes to enable it to grasp the singularity of open trajectories. It was also irreconcilable with a clear recognition of constants in the universe. Is in not significant that, from this second viewpoint, that a Langevin referred favourably to the dialectic of Hegel rather than to that of Engels? And is it not above all disconcerting that the contemporary interest in invariance was able to take ideological form of a structuralism expressly turned against dialectics and by that fact block a clear understanding of the what is nevertheless a real evolution of these same structures since the secret of this paradoxical evolution is without doubt to be

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4 In the passage referred to is, in the German original: 
“Die Dialektik, die ebenso keine hard and fast lines, kein unbedingtes allgültiges Entweder-Oder! kennt, die die fixen metaphysischen Unterschiede ineinander überführt und neben dem Entweder-Oder! ebenfalls das Sowohl dies – wie jenes! an richtiger Stelle kennt und die Gegensätze vermittelt, ist die einzige ihr in höchster Instanz angemessene Denkmethode.”

The word in question is “vermittelt”. The French version translates this correctly as “médiation” (mediation). The English version translates the word as “reconciles” which is incorrect.

5 Sève gives his own translation of this passage rather than that of the usual French translation.
found through the antagonisms which dialectically haunt non-antagonistic relations? My conviction is that this will require a vast collective effort of scientists and philosophers in order to take much further precise reflections on these major categorical determinations – such as, among others, on the mediation of the qualitative leap. This example is an extraordinarily interesting case. At the heart of the category of antagonism we have a logical asymmetry of two opposites the unity of which is not an identity in contrast with the poles of a non-antagonistic contradiction which are symmetrical. This is extraordinarily interesting once it is understood that the notions of symmetry and spontaneous symmetry breaking play a crucial role in the current theorisations of systems and processes in the physics of particles and in molecular biology. This takes us to a key point of reference of singular histories in recurrent determinisms. Those who want to work on the content of a contemporary dialectics of nature have plenty on their plates.

There are mix-ups and blind points in Engels' dialectics of nature. I have tried to show that on condition that we deepen the reasoning and go beyond its limitations it can become, nonetheless, the most heuristic of philosophico-scientific views.

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