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MATERIALISM AND THE "MAKABILITY" OF THE WORLD

Preface

This working paper is a first step in a study aimed at the development of a better understanding of the relationship between humanity and nature within a Marxist perspective. In the Marxist tradition the natural sciences are unfortunately often only considered as production factors resulting from a historical accumulation of human ingenuity, that is to say abstract labour condensed in a particular social context. The material dimension of human existence, its intrinsic biological limits as well as the question how our scientific achievements (the interplay between our environment and our labour) relate to the concept of a reality beyond humanity, has to a large extent and for a long period been underdeveloped.

Since the thirties the social roots of scientific developments have been clearly understood, and become objects of intense research. Due to the Stalinist, mechanistic distortions of dialectical thinking as well as the social-democratic, positivist attitude towards science as a neutral tool, few studies appeared in which the material basis of our thinking and the limits of our understanding of what we can call physical reality is taken as an object for research.

Since Marxism in the western world developed mainly as a discipline of historians, economists and sociologists, very little has been written on the role of science by people who are really involved in one of the natural sciences. It is typical that most authors dealing with science and materialism exhibit an total ignorance of the fundamental problems in modern physics or chemistry. Whilst Marx and Engels themselves took great pains to understand contemporary science and technology and whilst in our times many academic philosophers of science started their training in physics, within the left most of the studies published don't go beyond a simplistic interpretation of problems in modern science on the level of the popular literature. For that reason the already limited discussion remains in the "grammar" and state of mind of the discussion say between Lenin and the "empirio-critisists" [1].

The social need for a better understanding of the role and dynamics of science are clear for everybody, given the ongoing irreversible demolition of the planet's eco-structure and the proliferation of final solutions in the form of immense arsenals of nuclear and bacteriological weapons.

Marxists do not believe in good will as a social force but always leave the political choice between barbarism and socialism open. Therefore the fight for a democratic organisation of society can never be fulfilled without a better understanding of the constraints put on us by nature. In order to understand better the problems raised by e.g. socio-biology or genetic manipulation we need more developed concepts about our biological basis and its relation to other living creatures as well as the physico-chemical basis of biology.

In this Working Paper I try to clear the way for a new discussion on the role of nature and science in the framework of a socialist project, a project for the emancipation of humanity from its primitive state of oppression and exploitation. It would not be difficult to fill a weighty tome with critiques of all that has already been written on the relationship between human beings and nature. Though polemics are a popular form of socialist theorizing, I prefer not to comment on everything that I have read and don't like. I prefer to deal only with those works which in my opinion are useful for further probing into the problems.

As stated above, this Working Paper is a starting point for myself to stratify my thinking in order to proceed in a subsequent work with to in-depth analyses of the results of modern science and its relation to our understanding of our aim as socialists to change the world.

In the course of writing I received most valuable comments (with which I did not necessarily agree) from: Rob Gerretsen, Peter Holland, Marcel van der Linden, Ernest Mandel, Herman Pieterson, and Robert Went, to all of I am most grateful. Critical comments have only sharpened the argument. A shortened version was published in Dutch in "Kritiek, Jaarboek voor Socialistische Discussie en Analyse. Volume 3, 1993/94". For the editing of this English version I would like to thank Peter Holland and Peter Drucker for their invaluable assistance.

Joost Kircz,
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1) See e.g. David- Hillel Ruben, Marxism and Materialism, A Study in Marxist Theory of Knowledge. New and revised edition, The Harvester Press, Sussex, 1979.

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In the metaphysics of process we have to start with the notion that the totality is vast and beyond the measure of man, not only quantitatively but in the potential and actual richness of its qualities. Indeed, we *always* begin with 'what is', which is the unknown. From this, mankind can, at any point in its history, abstract a certain knowledge, having partial, relative, and limited validity. This abstraction is basically creative, i.e. the outcome of a movement of 'outward' participation and 'inward' perception of this participation. In this 'circular' movement mankind creates its percepts, concepts, language, and so on. What has been created up to a given time provides the very terms of communication available in that time. These terms enable us to focus on some limited aspects of the vast field of what is to be perceived directly with the senses, and to treat these as 'basic', 'essential', 'significant', 'relevant', while other far more numerous and richer features are treated as 'fortuitous' and 'irrelevant'. Experience guided by these notions is then always showing us the limits of validity of the corresponding abstractions. These limits indicate the need for extending the 'circular' process to create newer abstractions leading to new percepts, concepts, language, etc. David Bohm [2]

0. INTRODUCTION

If we look at the world around us, over and over we are frightened at everything that has gone wrong. Every concern for social progress, cultural development, and for the liberation of humankind from social and physical misery seems to be swept away. None of the large political currents expresses hopes or prospects which trigger any enthusiasm. Sometimes it looks as if progress and development have stopped and are turning its powers against us. Every technology generates its pollution, every scientific discovery can be used for human destruction. Every example of a new social order, such as Cuba, Vietnam or Nicaragua, turns out be squashed by the economic strangulation of the imperialist powers or by direct military intervention. The western social-democracies show their best side by being excellent bookkeepers of a declining economy. Air and water, in a form fit for human consumption, are in danger of becoming commodities instead of being freely available. Within the intellectual circles of the bourgeois camp, their own impotence is translated into so-called post-modernism, an ideology which essentially denies the human capacity for progress and emancipation. Was not the innovative bourgeoisie the driving social force in the past? Didn't it, apart from the destructive aspects of unbridled competition and profit hunger, champion the positive employment of science and technology for medicine, food-supply, and social well-being? At present the historical end of this period is demarcated theoretically by bourgeois declarations of the end of progress and even the end of history as such.

This crisis in liberal bourgeois culture combined with the collapse of the Soviet Union under the weight of competition on the world market, the arms race and its own internal degeneration seems to give a free hand to those ideologies of the right which want once and for all to settle the account with socialism as a political -modern- current. Are we making our last tearful rounds on rubbish-dump-earth around the sun? Do we have to abolish our scientific and technological knowledge in order to return to a pre-scientific culture?

The whole history of humanity has proven that there never is a way back. The only sensible question humanity can pose to itself is "How do we overcome the current misery and how do we build another social order?". All other ways lead either to acceptance of the misery or to direct regression as we see it expressed in the ultra-right's intellectual poverty. The main characteristic of socialism is the quest for human liberation. This quest is as timely now as it was 100 years ago. But in this 100 years socialism has not yet changed the world and no breakthrough has happened in any of the highly developed countries. Often we hear that therefore also Marx and Engels and their school have nothing more to say, are superseded, etc. In all these cases no attempt is made to put forward other, alternative ways of development. On the contrary, for the latest fashion, that of post-modernism, even the idea of development is too much to ask.

For socialists the story is never finished but always in development. The question is not how individuals are able to adapt to the chaos around us, but how conscious collective action is able in practice to create a social order which is free from exploitation and oppression. That positive aim in life is at the root of socialism. In order to give content to such a goal it is imperative to study and develop, within all its constraints, the possibilities of humanity to shape the world. The idea of the "makability" of the world, of taking fate in our own hands, is the political sting of any socialist project.

In order to be able to change the world we have to know it as well as we can. Therefore not only factual knowledge has to be collected, but particularly the dynamics of the different components of

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2) David Bohm. "Some remarks on the notion of order", and "Further remarks on order". In: C.H. Waddington (ed), Towards a Theoretical Biology. Edinburgh Univ. Press 1968, p.59.

humans and nature -in their own development and in their mutual interactions- have to be placed in a clear theoretical framework. An understanding of reality, of which we are ourselves an integral part, is one of the preconditions for taking conscious political and socio-economic policy measures that will make our human world a better and healthier place.

Despite the periodic issuing of death certificates, Marx and Engels' original ideas still constitute a foundation which goes beyond a whole series of subsequent alternatives. In the present article Marx and Engels will be critically examined to demonstrate how useful their works still are. This is done however without entering into a polemic with all kinds of anti-socialist currents. The main goal is to get the conceptual point of view clear. Some digressions are necessary because their works nowadays attract more death certificates than readers. Based on an overview of some important discussions in the Marxist movement, this article is also an attempt to get the goals more sharply defined. From this a foundation will be laid from which the discussion on science and technology, on ecology and the biological constraints of people, can be again placed in the framework of the human ability to make the world.

The present article starts with a definition of the problem, after which a refinement of the conceptual apparatus will be proposed. Thereafter Marx and Engels will be dealt with and it will be proved that they took the underlying material conditions of human existence most seriously. Subsequently Lenin and further developments in the Soviet Union will be discussed. Next I deal with the "sociologizing" of nature, where, in reaction to the mechanistic tendencies of the Second International as well as the brutal simplifications of Stalinism, the materialistic child is thrown out with the philosophical bath water. At the end, a series of suggestions for the next stage in the discussion will be given.

1. DEFINITION OF THE PROBLEM

1.1 Presenting the question

The self-emancipation of humanity from poverty, enslavement, and misery is the political basis of socialism. This emancipation represents the transcendence (in the sense of negation and overcoming at the same time) of a situation in which social relations between people appear as law-like relations between things, towards a situation in which people consciously design their mutual relations as well as their relationship with nature. This emancipation is a conscious human process. In order to be able to shape the world, knowledge is needed about the possibilities and impossibilities of this very "makability".

Since the Enlightenment, the gathering of knowledge in order to use it for conscious and determined mastering (that is to say using and developing) of nature is a central theme. Science and education are instruments for a better world. The application of acquired knowledge is supposed to result in developing the world, to create new possibilities for humanity, and to make human beings fully-developed and happier creatures.

With Marx and Engels the tradition of the makability of the world enters a new phase. Next to knowledge of nature and the natural forces as such, they assign a pivotal role to the productive relations and productive forces in applying this knowledge in an emancipatory way. Marx and Engels introduce human labour and labour relations as central for mastering existence. However, creative human labour provides humanity (and with it the natural environment) not only with the comfort of central heating, but also with the discomfort of a manifest capacity for ultimate self-destruction. The discussions about war and peace, armament and disarmament, medicine and eugenics, hunger and bio-industry, welfare and urbanisation, drinking water and soil pollution, etc. all have, along with the inter-human relationship a common basic kernel: the relation between humanity and its biological substrate as well as its natural environment. To what extent is humankind determined by its underlying biology? To what extent does humanity transcend biology and to what extent does humankind escape from matter? Is not humankind the only living species which is able to mould its own life environment to its needs, and that inhabits the whole earth in spite of (changing) climates and soil conditions?

The relationship between people and nature is the basis of all discussions regarding the blessings and dangers of science and technology and therewith the whole issue of ecology.

The tradition of historical materialism gives a clear start for an integrated discussion of the social relationship between human beings as well as the relationship between humans and nature. The development of Marxism is however, just as with all other expressions of human thinking, dependent on its social-historical environment. Marx and Engels gave a monumental impulse towards an integrated understanding of human/matter relationships, based on their world and experience. Dialectics as a mental tool for tackling this complex of problems towers above a one-sided materialism, in which human thinking and action is thought of as unambiguously determined by the underlying physico-chemical processes, as well as above a one-sided idealism in which humans are considered as superior and opposed to nature. In historical materialism there is no watershed between body and mind; although in

opposition to each other, they comprise a whole embodied in the human being. In Marx' and Engels' approach materialistic (bodily) existence is considered as a necessary but not immediately determining cause of socially mediated thinking, dreaming and idealization, as well as of the capacity for a conscious alteration of one's own living space.

Changing and making a living space depends on one's capacity to name observations and make them operational. Giving an object a name (a spear or an electron) helps to make it usable for social transactions. The object acquires a use-value that goes beyond the private use for the individual.

The development of language is, similarly to the development of tools, necessary for a deeper understanding of our world and therewith for the capacity of conscious action. Without the development of the notions weight and mass no mechanics would be possible, without the notions surplus value and class there would be no socialist theory. The introduction of more and more refined notions is therefore essential for further development.

The history of humankind is characterized by both the development of language and the invention of devices (tools that nature does not directly provide itself, such as a bow and arrow, a hammer drill or a synchrotron). The chicken and egg discussion on the priority of language over tools or vice versa is very much present in the Marxist tradition [3]. To me the discussion of priority is not of fundamental importance. Notion and concept formation [4] is the abstract presentation in language of human action and experience. The more extended the division of labour, the more types of human labour emerge, the more tools will be invented and the more complicated, delicate and abstract linguistic communication systems will grow. The force of the abstraction and the construction of non-tangible notions in their turn enable theory formation, on the basis of which new tools can be invented. Language and tools influence and stimulate the development of each other. Both are expressions of human labour. It is this notion of human labour as the basis for further analysis which forms the leitmotif of this article.

The ability to change consciously the world is a human capacity which results from the quality of our description and understanding of our world, a quality which increases in history. Not only the dream for a better existence but, linked to that, knowledge of the dynamics of our world is a precondition to actively giving direction and content to this dream. This process of theory-building is what Marx and Engels call scientific socialism.

Just as all dreams are an expression of actual knowledge and experience, with the development of conscious social change the picture of the future shall change with our successes and failures in our interactions with "nature" as well as in our inter-human relationships.

1.2 The concept of nature

In analyzing the relationship between people and nature, we encounter the problem that the concept of nature is used in many different ways. In order better to understand the role of humankind and its relationship with nature it is useful first to make a clear distinction between the different meanings the noun "nature" has been given.

Traditionally a distinction is made between nature1 before humanity transformed it and nature2 which is nature transformed by people.

> The latter comprises all products of the human will, all *objectifications*. We can conceive of culture, history and society as second nature. Now Marx thought that the more man transforms nature, the more he understands its principles and laws. In this process nature1 becomes nature2. Marx saw the natural sciences as having made great progress in this respect whereas the social realm was still awaiting its revolution. "Revolution" here is to be taken literally for Marx thought that a social revolution was necessary to establish nature2 properly. After the social revolution, therefore, no social science will be needed any more. To repeat: Hegel maintained that the existing forms of nature2 (law, state, society) were the manifestation of reason; Marx, on the contrary, maintained that, since nature2 acts upon man in a 'natural' way, in a way which is not understood ('blind wirkende Naturgesetze'), it cannot be the manifestation of man's reason, but only a distorted version of it [5].

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3) F. Engels (1884), The Origin of the Family, Private Property, and the State. Lawrence & Wishart, London, 1972. Charles Woolfson, The Labour Theory of Culture. Routledge & Kegan Paul, London, 1982.

4) In the following I will call a general thought a concept, whilst a notion is a more manipulable entity. Compassion is a concept, scissors is a tangible notion, temperature is a non-tangible notion.

5) See for an extensive discussion: Reiner Grundmann, Marxism and Ecology, Claredon Press, Oxford, 1991, p.94.

In my opinion this bipartition is insufficient and it is advisable to introduce a more formal tripartition [6].

1) Non-living matter
In this category nature constitutes the material (chemico-physical), lifeless building bricks of our existence; a nature which exists without human, animal or plant [7]. As long as humans do not exist (that is to say, humans as independent thinking agents, not necessarily the animal the reader sees in the mirror), this is a universal reality of mutually connected forces and matter (Friedrich Engels calls it "moving matter"). Strictly speaking we are unable to say anything about this "being". Only with the appearance of humankind as an acting and thinking subject is this lifeless matter objectified. The discussion of how nature "looked" before the arrival of humankind (or human-free nature as in a far-away star or gas nebula) is a discussion between people, and a result of human labour. In order not to complicate the discussion unnecessarily I will just speak about matter without going into exact definitions [8]. Within this category of nature also fits the "natural wealth" which forms the raw materials for humans. Naturally these are only a source of wealth once human development constitutes them as such. (Uranium ore only became a natural resource after the invention of the nuclear reactor as an energy source, and this as a result of the discovery of the natural process we call nuclear fission.) The natural sciences occupy themselves mainly with this category of nature. Further on we will see that Engels in particular became fascinated by the extent to which dialectics is able to restore a totality to all the interactions of analytically independent concepts.

2) Living matter
Here nature is the biological system that humankind is part of, the ecosystem. In normal speech it is this category which is meant if one speaks of nature or natural environment. It is this nature (the sea, the air, the land, the plants, and the animals) plus non-living nature in the form of e.g. ores, of which Marx speaks when he refers to nature as the source of wealth (nature1, see above). Neither he nor Engels always makes a clear distinction between non-living and living matter. Together they are traditionally seen as the grab bag for the satisfaction of human needs.

The ecosystem, which in a certain phase of development enabled humankind to develop, can be seen as transcending non-living nature, as "moving matter". Nature as physico-chemical reality turns out to organize "itself" into the complex systems of the plant and animal world resulting in the evolutionary development of humanity. There is more here than a semantic problem in the use of the metaphor that non-living matter organizes "itself" into living matter; strictly speaking non-living matter is not a subject and therefore is unable to organize "itself". On the other hand, all our knowledge points to the fact that life evolved from non-living matter. The driving force in this process is a subject of research. To argue away this problem by the introduction of a supernatural force (e.g. God), or by declaring the problem outside historical materialism (see below), deprives us of the opportunity to delve deeply into the problem of knowing our world consciously in its development in order to be able to change it. The evolutionary development of humankind towards subject and its further development as subject cannot be separated from each other. Humanity makes its environment and is only able to do that for its own profit (and certainly in the long run) if it understands its biological and material determination.

3) Thinking matter - Humanity
Living matter provides the basis for a new, more complex, form of life, conscious and acting human life. In humanity, not only non-living matter, but also living matter is transcended and thinking matter takes shape. It is here that we see a natural product that is part of both non-living and living matter, and is opposed to it. Humankind as being subject objectifies its environment and subdues it. That we deal here with a transcendence and not with a deterministically reducible process can be clearly seen if we realize that human thinking on the one hand is able to create and shape its environment in harmony with the internal structure of nature around us (and so expresses it). In other words, thinking can be seen as an expression (or extension) of the inner dynamics of non-living and living matter as is proven by the fact that our thinking enables us to theorize about this underlying dynamics and to develop theories, methods and applications in order to make use of this dynamics for our own goals. On the other hand thinking is able to become totally "free" of any realizability and can generate the most unachieveable fantasies, dreams and obsessions (and so denies its natural constraints).

In this tension much confusion arises in the ecology debate. We see currents which in fact deny the

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6) In a sense I follow here the suggestion given in: Tony Smith: Hegels's theory of the syllogism and his relevance to Marxists. Radical Philosophy 48 (spring 1988), pp.30-35.

7) The term "dead matter" suggests that there was life which died. First there was lifeless matter, after which living matter emerged. The latter can die and return to the state of lifeless matter.

8) In principle I consider matter everything that we call heavy masses and fields in modern physics.

transcendence of thinking matter over living matter and demand that humanity reunite with the flowers and the animals. Here we see a lot of romantic nonsense on the perceived peacefulness of "nature", where ox and ass make a birth visit, cuckoos lay their eggs in their own nests, and wasp larvae do not nibble their living hosts. This is contrary to the harsh reality of the real world where every life form is food for other life forms. In the real world natural forces can destroy life completely. Meteor impacts and/or volcanic eruptions brought about the global death of whole evolutionary lines. The influenza pandemic after World War One caused more victims than the war itself. Marx always ridiculed all romanticization of nature. He underestimated however the way in which humankind is able to poison its own eco-structure. He thought that the pollution of the environment (e.g. of the textile industry) was only a capitalistic excess. Human capacity for the employment of non-living and living matter for its own needs and pleasures doesn't mean that this capacity is necessary beneficial. The domination of nature is more than the knowledge of productive applications. As Grundmann correctly states:

> Once we realize that domination only makes sense with respect to aims and interests, it becomes clear that a concern for the natural environment is not only compatible with a Promethean view but follows inevitably from it. ...Powers which turn into an existential threat for the power-holder do not contribute to domination (à la king Midas, who turned everything into gold by just touching it) [9].

and:

> In my view 'domination of nature' is not responsible for ecological problems; quite the contrary: the very presence of ecological problems proves the absence of such a domination [10].

2. MARX AND ENGELS

For the discussion within the socialist movement and in reaction to anti-socialist currents it is of great importance to define clearly the role of Marx and Engels. This is especially necessary because in the Soviet Union, under the mask of communism, such a disastrous industrial policy was carried out that many environmentally conscious people turn their heads away in distress just from hearing Marxist terms.

Much has been written on Marx's concept of nature and the relationship between humankind and nature. Marx considered different aspects of this relationship intensively, in particular the role of natural resources as raw materials for an economy. Marx also treated exhaustively the role and place of technology. Engels, especially in the period from his retirement as an industrialist until Marx' death, involved himself actively with the study of the relationship of humankind and nature, and the (liberating) role of technology and science. In itself both friends' studies are of great importance. Of greater importance however is the way that their (necessarily historically limited) works can be taken as a starting point, so as to develop a contemporary analysis drawing on the experiences and enormous development of the natural sciences since their time. Such a point of view goes beyond that of Marx and Engels, in part being a extension and in part in contrast with theirs. As has been said above, it is important to start from a sharper definition of the various meanings of the concept "nature".

Marx develops his thinking in what was for humanity an extraordinarily dynamic period. The systematizing of two centuries of scientific thought in interaction with the emerging hegemony of the West expressed itself in a fascinating blossoming of well-organized applications of science and technology in economic life. The successes of mechanics, thermodynamics, and electro-magnetism shaped the whole 19th century. They changed life on earth definitively through the industrialisation of production. For the first time in history human sweat in the form of air and water pollution spread over the whole planet, a "green" notion Marx and Engels were most aware of [11].

In his search for a theoretical foundation for the direction of the struggle (the programme) for human self-emancipation, Marx followed closely the contemporary way of scientific thinking and analyzing. He started with the observation that humankind itself is the only agent for human emancipation, and that therefore one can only raise humanity out of its suffering by analyzing and subsequently changing the

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9) Grundmann, loc. cit. p.2.

10) Ibid. p.15.

11) In the description of the living conditions of the industrial working class Marx and Engels stress in all their works pollution and the demolition of nature. Engels dwells at lengths on the unique human capacity to destroy its own environment in his article "The Part Played by Labour in the Transition from Ape to Man" (1876). This is included in the collection Dialectics of Nature, Progress Publ., Moscow, 1976, pp.170-183.

actual social order. In revealing the static and dynamic components of this order one can develop a programme to transform the actual order into a new one: an order where (the origins of) capitalist oppression can be left behind [12].

An important cornerstone of any analysis of society is to determine which aspects are dynamic and which ones relatively static. In a first approximation it is acceptable to consider non-living matter and its "laws" as given, whilst social organization, which consciously employs knowledge of nature, is dynamic. In other words: during the slow evolution of the geology of the earth and the biology of humankind we can consider them as more or less constant data. In contrast to this we can consider the organization of society, which is actively made by humanity, as dynamic.

The *Bible*, which is the basis of Western thinking, very clearly starts with the total subordination of nature to humankind [13]. Contrary to this plunder of nature, Marx and Engels signal that even if the social order might be to a large extent independent of "nature", humanity itself still comprises an integral part of it. Humankind as a product of nature alters nature and hence itself. No fundamental sharp division can be made between static (natural) and dynamic (human social) organization. Obviously there is a functional boundary. So there is a break with the idea of humanity as an independent phenomenon separately created by God.

For Marx as a child of his time and influenced by the successes of the sciences of his time, it looked as if nature in the sense of the matter of which we are constituted is completely comprehensible in principle. This point of view means that there must exist trans-historical laws and that humankind discovers these "natural laws" slowly but surely (we will return to this point more extensively below while dealing with Lenin's reflection theory). Marx's idea of fundamental laws which always rule and only appear in different shapes is illustrated in a letter of 11 July 1868 to his friend Kugelmann, in which he writes:

> No natural laws can be done away with. What can be changed in historically different circumstances is only the *form* in which these laws assert themselves [14].

Without going exhaustively into the problem of the knowability of non-living matter (this is a project Engels tried to tackle again in the last part of his life) Marx and Engels first started with the socially and politically more important problem of the role and place of humankind in the employment of non-living and living matter for its own benefit.

An important part of the process of formation of Marx's theory is his linking up with Ludwig Feuerbach, for whom human sensory perception is central. But Marx goes further than sensory perception and identifies conscious, practical, human action as central to the distinction between humans and animals:

> Feuerbach, not satisfied with *abstract thinking*, wants [*sensuous*] *contemplation*; but he does not conceive sensuousness as *practical* human-sensuous activity [15].

In identifying humanity and its capacity to intervene consciously in events as a central notion, Marx and Engels position themselves in opposition to philosophers of science who take the laws of science as generally applicable and the development of knowledge as a straight road, which is muddled through. For Marx and Engels, laws are not relations between (human independent) things, but relations between human beings. They did not however go so far (as we have seen in the letter to Kugelmann) as to see the relations (laws) of non-living matter objectified by people as relations between notions named by people. We will dwell at the end of this article on the necessary elaboration of the historicity of the objects of physics.

The heyday of classical mechanics and electro-dynamics was also the heyday of a renewed, albeit mechanical materialism, in which human thinking and action were seen as linear results of physico-chemical processes. Marx and Engels not only spent a lot of energy in the fight against the utopians and other idealistic philosophers and politicians; they also challenged fiercely the new materialists who, in their enthusiasm for the fantastic results of science and technology, saw humankind and human thinking as a higher level of 'lawlike' behaviour, for which -in principle- no borders between higher and lower

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12) The transcendence of capitalist forms of oppression and exploitation doesn't mean that in a more democratic society new forms of injustice and exploitation cannot develop.

13) Genesis 1:28-29.

14) "Marx to L. Kugelmann in Hanover" in: Karl Marx and Frederick Engels, Selected Works in Three Volumes, volume 2, p.419, Progress Publ., Moscow, 1976.

15) 5th Thesis on Feuerbach, Karl Marx, Theses on Feuerbach, Karl Marx - Frederick Engels Collected Works (MECW), vol. 5, p.4. International Publishers, New York, 1976.

organizations of matter exist. For these mechanical materialists life and thinking are direct consequences of an ever more complex organization of non-living matter. In itself this materialism, in its anti-religious stand, was a progressive expression of developments in science and technology [16].

Marx and Engels wage war on two fronts their whole life. While still young they attack Feuerbach as well as the woolly German idealists head-on in *The German Ideology* and *The Holy family*. In their critique they develop the necessary instruments to go further. The mutual determination of categories, of object and subject is analyzed as a dynamic growth process. Concretely: the development of humankind is a historical process, in which humans (thinking living matter) in interaction with non-living and living matter develop themselves and by using their unique capacity for productive labour create a social order which is the historical result of their own productive development.

A dynamic theory, in which the exploring subject and its environment do not exist in the same form without each other, is pre-eminently dialectical. The transcendence (Aufhebung) of oppositions is at the same time the affirmation of their mutual determination as well as their negation in the "elevation" towards a new, unique entity: a dynamic relationship in which continuities and fractures are interconnected stages of one and the same process. E.g., humankind has its physical characteristics (bones, blood, hormones, etc.), whilst these characteristics in their (as far as we know) highest stage of complexity are being negated and transcended in unbounded and free thinking.

In the development of an historical theory of social organization and the causes of the miserable conditions in which people live, Marx understandably did not always take non-living matter into account in his analyses. In order to understand human thought and action, it is in a first approximation sufficient to take people as defined as fixed biological species and to consider lifeless nature as stable. The next step is then a search for the most important features of human action in moulding humans' living space and the role of the societal order in this process.

From the beginning with Marx and Engels, humans' capacity for creative production was characterized as their pivotal feature:

> The first premise of all human history is, of course, the existence of living human individuals. Thus the first fact to be established is the physical organisation of these individuals and their consequent relation to the rest of nature. Of course, we cannot here go either into the actual physical nature of man, or into the natural conditions in which man finds himself - geological, oro-hydrographical, climatic and so on. All historical writing must set out from these natural bases and their modification in the course of history through the action of men.
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> Men can be distinguished from animals by consciousness, by religion or by anything else you like. They themselves begin to distinguish themselves from animals as soon as they begin to produce their means of subsistence, a step which is conditioned by their physical organisation. By producing their means of subsistence men are indirectly producing their material life [17].

We find this same idea again more then twenty years later in *Capital*, when Marx counterposes the conscious human production to "instinctive" production by animals:

> But what distinguishes the worst architect from the best of bees is that the architect builds the cell in his mind before he constructs it in wax [18].

From an analysis of human labour the notion of labour-power emerges, which as an exchangeable and measurable entity plays a central role in the treatment of capitalist economic theory, as worked out in *Capital*.

Especially in the first chapters of volume one of *Capital*, Marx again dwells on the unique role of the human capacity for creative production and its central position in the transformation of unusable non-living (dead) matter into "consumable" matter necessary for human maintenance:

> Use-values like coats, linen, etc., in short, the physical bodies of commodities, are combinations of two elements, the material provided by nature, and labour. If we subtract the total amount of useful labour of different kinds which is contained in the coat, the linen, etc., a material substratum is always left. This substratum is furnished by nature without human intervention. When man engages in production, he can only proceed as nature does herself, i.e. he can only change the form of the

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16) See for a most useful overview: Frederick Gregory: Scientific versus Dialectical Materialism: A Clash of Ideologies in Nineteenth-Century German Radicalism, ISIS 68(242) 1977, pp.206-223.

17) MECW Vol.5, The German Ideology, p.31.

18) Karl Marx: Capital Volume 1, Penguin Books, 1988, p.284.

materials [19].

It is of importance to stress here again that Marx, completely in line with the state of the art of the natural sciences of his time, sees matter as unchangeable "primitive matter", which according to knowable laws can be shaped into useful form by humans. For Marx, thinking is a natural process that is shaped by social intercourse.

> Since the thought process itself grows out of conditions, is itself a *natural process*, thinking that really comprehends must always be the same, and can vary only gradually, according to maturity of development, including the development of the organ by which the thinking is done. Everything else is drivel [20].

Social relations are the result of the impact of this thinking on the environment, an impact that is determined by the necessity of maintaining the capacity for thought (human life): that is to say, the necessity of satisfying the needs of the biological substrate (our body) by means of eating, drinking, love-making, warmth, shelter, etc. The moulding of non-living matter and the animal world to the needs and wishes of humankind, does not find its basis purely in thought (otherwise all idealistic dreams would have already led to results), but emerges from the application of the capacity of thought to the organization of the conditions for physical survival. For in situations of scarcity, Brecht's saying "Erst kommt das Fressen und dann die Moral" is illustrated most forcefully. It is not for nothing that Marxism posits the abolition of scarcity as a precondition for a genuine communist society. Within the Marxist movement, often from "idealistic" motives with the best intentions, this physical element is disregarded. It is the great merit of Sebastiano Timpanoro that he brought the physical element back to the centre where it belongs. In the introduction to his book *On Materialism* he puts it with provocative clarity:

> If, however, as is too frequently the case in the Western Marxism of our century, what is meant is denial of the conditioning which nature continues to exercise on man; relegation of the biological character of man to a kind of prehistoric prologue to humanity; refusal to acknowledge the relevance which certain biological data have in relation to the demand for <u>happiness</u> (a demand which remains fundamental to the struggle for communism); then these pages are deliberately 'vulgar materialist'[21].

Further he dwells on the primary importance of the physical sub-structure of human existence.

> By materialism we understand above all acknowledgement of the priority of nature over 'mind', or if you like, of the physical level over the biological level, and of the biological level over the socio-economic and cultural level: both in the sense of chronological priority (the very long time which supervened before life appeared on earth, and between the origin of life and the origin of man), and in the sense of the conditioning which nature <u>still</u> exercises on man and will continue to exercise at least for the foreseeable future. Cognitively, therefore, the materialist maintains that experience cannot be reduced either to a production of reality by a subject (however such production is conceived) or to a reciprocal implication of subject and object. We cannot, in other words, deny or evade the element of passivity in experience: the external situation which we do not create but which imposes itself on us [22].

An example can be that before the discovery of radioactivity scientists were able to observe (passively) statistically real increases of cancer in certain environments, but this then remained an incomprehensible phenomenon.

Marx concentrated on social and economic studies. Taken people's biological state as given, he tried to reveal the laws of motion of society: laws of motion which would become tools for conscious human political action aimed at creating a social structure in which the exploitation of people by people would cease to be a possibility.

At this point three statements are important for our subject.

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19) Capital Volume 1 p. 133

20) Letter to L. Kugelmann, July 11, 1868. Ibid. p.419.

21) Sebastiano Timpanaro. On Materialism. NLB, London 1975, p.10.

22) Op.cit. p.34.

1- Marx considered economic laws on the same footing as the laws of natural science. Opposed to fantasizing about a better world, he wanted -entirely in line with modern natural science- to lay bare the mechanism on the basis of empirical research. This is a project that was already clear for him at an early age.

> The changes in the economic foundations lead sooner or later to the transformation of the whole immense superstructure. In studying such transformations it is always necessary to distinguish between the material transformations of the economic conditions of production, which can be determined with the precision of natural science, and the legal, political religious, artistic or philosophic - in short, ideological forms in which men become conscious of this conflict and fight it out [23].

Here again Marx (metaphorically) linked up implicitly with the idea of imperishable natural laws, without stipulating that these laws represent relations between historically determined notions.

2- Marx implicitly connects economic laws with the laws of non-human nature. Surviving, eating and procreating are "organic" qualities provided by non-living matter. The material metabolism of humankind (with its emphasis on the stomach-intestines canal) is a physico-chemical process after all. The struggle for life, in economic terms the struggle for the division and appropriation of production, takes place at the interface where non-living matter "transcends itself" and produces living matter. This means that the quality of living matter is dependent on the quality of non-living matter (food, shelter, etc.). A 'healthy' thinking and 'humane' social consciousness is the expression of the 'healthiness' of the underlying process. Concretely: an economy that destroys "nature" cannot lead to a 'healthy' human society. Human nature demands an organic association with "nature". Humanity is an expression (a consequence) of nature and not a detached alien element.

3- Marx fought against moralising about people's intrinsic kindness. Humanity develops as a social being. Human social feelings do not descend from heaven, but arise as part of an historical, evolutionary process. Marx and Engels were therefore extremely enthusiastic about Darwin's theory of evolution. Knowledge of the action of physical (pre-human) characteristics and needs on thinking and social functioning will make possible the building of a 'humane' society. Not by giving room to the so-called forces of nature such as masculinity and motherhood, but by consciously building in the necessary social 'checks and balances' by applying knowledge of human physical limitations and their consequences [24].

While Marx took on the task of grasping the capitalist economy in order to find levers to transcend it, Engels developed an unbelievable variety of interests. Engels joined as an industrialist an enormous erudition with a very practical political choice of subject. One of his most important achievements is that he was one of the first to stress the increasingly tight link between economy and technology (among others through studies on the importance of arms technology). With the emerging industrialisation, technology gets all the attention. The pure sciences trail behind social developments and lose their subordinated place with respect to classical philosophy in favour of a close tie with technology. Science no longer poses 'philosophical' questions as central, but becomes more and more a 'problem solving' counterpart of technology. In a beautiful article Bayertz and Krohn elaborate on this theme [25]. Engels is also the founding father of subsequent studies on the social ramifications of science and technology as introduced in the thirties by Hessen and Caudwell, reaching fruition with Bernal [26].

Only when Engels retired from his work in 1869, was he able to indulge himself fully in the subjects

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23) Karl Marx. Preface (to A Contribution to the Critique of Political Economy, 1859), in: Early Writings, Penguin Books, 1975, p.426.

24) See for an extensive discussion on human nature: Norman Geras. Marx and Human Nature; Refutation of a Legend, Verso, London, 1983.

25) Kurt Bayertz en Wolfgang Krohn. Engels Im Kontext. Natur- und Wissenschaftsphilosophie im Zeitalter des Szientismus. DIALEKTIK 12, 1986, pp.66-98.

26) B. Hessen. The Social and Economics Roots of Newton's "Principia". in: Science at the Cross Roads, Kniga, London 1931. See for a review of this unique Russian historian, Loren R. Graham, The Socio-Political roots of Boris Hessen: Soviet Marxism and the History of Science. Social Studies of Science. vol.15(1985) pp.705-722.
Christopher Caudwell, The Crisis in Physics (1939), in: The Concept of Freedom pp.179-259, Lawrence & Wishart, London, 1977.
J.D. Bernal, Science in History (1965), MIT Press, Cambridge, Mass. 4 volumes, 1971.

which has been left on the shelf since the *German Ideology*. Unfortunately practical politics takes a permanent toll. The discussions within German social democracy demanded his continued attention, whilst the early death of Marx forced him to finish his friend's posthumous works for the press. Engels himself kept notes on the natural sciences. These notes, never intended for publication, were intended to be records for an extensive work on materialism and nature. Only after his death were parts published. The complete collection was issued as *Dialectics of Nature* in 1925 and immediately misused in the Stalinist vulgarization of historical materialism. Engels used elements of these notes for his polemic against the German professor Dühring, who around 1870-80 had a great influence on German social democracy.

The book *Anti-Dühring; Herr Eugen Dühring's Revolution in Science* is a vehemently polemic work, making mincemeat of its victim (in the sarcastic style both Marx and Engels loved very much). It is an attempt to expand historical materialism as an intellectual system -against all types of model builders- into a universal approach which encompasses the totality of nature and humankind. Antithetical to the so-called vulgar (reductionist-deterministic) materialists on the one side and the hazy social thinkers on the other side, Engels saw the political necessity of providing the rising labour movement with a comprehensible and encompassing world-view, which would be able to develop its own answers on all aspects of capitalist culture [27]. Engels did not take this task lightly. He spent years on the study of physics, chemistry and mathematics. In his 1878 preface he phrased his dilemma as follows:

> Nevertheless it was a year before I could make up my mind to neglect other work and get teeth into this sour apple. It was the kind of apple that, once bitten into, had to be completely devoured; and it was not only very sour, but also very large [28].

and in his preface of 1885 he again stated clearly how he sees his work as political and conjunctural:

> Besides I am under the obligation to prepare for the press the manuscripts which Marx has left, and this is much more important than anything else.....This book is a polemic,...[29].

The project Engels defined for himself is to prove that dialectics is intrinsic to nature. That is already so on the primitive level of non-living matter when one can argue for the superiority of dialectics over formal logic. In *Anti-Dühring* as well as *Dialectics of Nature* he played with all kinds of examples from the natural sciences and mathematics. The impression is given that Engels sees dialectics as given by nature instead of being merely a superior approach with clear roots in reality. Especially in these later works Engels emphasises natural (biological-environmental) determination side-by-side with economic determination "in the last analysis" [30].

For many Engels is seen as a founder of the later Stalinist dogmatism. This is on the one hand because the high priests of so-called Dialectical Materialism refer to both the works of Engels (as well as to Lenin's polemics against idealistic currents in the party -see below), and on the other hand because whole tribes of anti- and half-socialists try to make a division between the subtle genius Marx and the dogmatic positivistic Engels. As Carver puts it:

> Engels's spurious science and factitious method are distractions from Marx's substantive analysis, which might be of help for us. Even if it were not, Marx's vision of what constitutes a *problem* in society and his eclectic approach to method would stand us in good stead. On both those points the influence of Engels has not merely been distracting; his Hegelian pretensions and methodological monism have for many years obscured Marx's achievements [31].

This literature goes in parallel with the attempts to split the Young Marx apart from the economistic Old Marx [32].

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27) For a discussion on Engels and his attacks on contemporary philosophers see also: Ted Benton., "Natural Science and Cultural Struggle: Engels on Philosophy and the Natural Science". In: John Mepham & D-H. Ruben (eds), Issues in Marxist Philosophy, Volume 2, Materialism. The Harvester Press, Brighton, 1979, pp.101-137.

28) F.Engels, Anti-Dühring; Herr Eugen Dühring's Revolution in Science, Progress Publ., Moscow, 1977, p.10.

29) Op.cit. p.14.

30) See for this discussion also: Karl Korsch, Maxisism and Philosophy (1923), especially footnotes 55 and 75, Monthly Review Press, New York, 1970.

31) Terrell Carver. "Marxism as Method". in: Terence Ball and James Farr (eds), After Marx. Cambridge UP, 1984.

32) It would go too far from our discussion to dwell further on this point, as also this apple is not only very sour but also very large. A very readable refutation of lots of nonsense can be found in: S.H. Rigby, Engels and the Formation of Marxism. History, Dialectics and Revolution. Manchester UP, 1992.

The importance of both these works of Engels is that they are serious attempts to reach a totality, in which non-living and living matter could fit together. Engels tried to provide an overview of the sciences of his time and he succeeded marvellously. It is utterly unimportant to take the scientific correctness (according to our norms today) or some frivolous extrapolations as the starting point for a critique. As a child of his time he builds on three monumental discoveries: the cell theory (according to which a single entity splits and a manifold of cells reaches a higher state of organization), the theory of evolution (displaying a unity of antagonistic interests in the "struggle for life"), and thermodynamics (with its transformations of quantity into quality and vice versa). The essence of Engels' effort was a) to make clear that the understanding of nature requires a dialectical approach instead of a formal, logical one and b) to make clear that this science is not just a mental fabrication, but that science is an essential expression of the material reality of living. The success of science is an expression of real existing processes and structures in the cosmos.

> That is how things happened in society and in the state, and this way, and not otherwise, *pure* mathematics was subsequently *applied* to the world although it is borrowed from this same world and represents only one part of its forms of interconnection - and it is only *just because of this* that it can be applied at all [33].

If one tries to find in Engels' polemics and notes a new closed world view, a replacement for 2000 years of philosophy of science and an antidote to its idealistic tendencies, than these works are certainly sadly deficient. If however one tries to put oneself in Engels' place, and reads his notes as an extraordinarily enthusiastic account of the tremendous progress the sciences were making in the description of (non-living and living) matter as a dynamic growth process of interactions between various natural forces, than these works have much to contribute. Engels was not a system builder, but an inquisitive person with an inclination towards instrumentalism, who tried to grasp the totality of unfolding science and technology in relation to the enormous industrialisation at the end of the 19th century. Engels saw here the proof that rational theory formation indeed is able to understand the world, to uncover its dynamics and can be used to change it consciously [34].

In conclusion: Engels' goal was to attack idealistic philosophy and to demonstrate the material sub-structure of living and thinking. In order to strengthen this attack, he absorbed himself in the natural sciences. In this quest he discovered the power of dialectics and its three classical laws (the transformation of quantity into quality and vice versa, the interpenetration of opposites, and the negation of the negation) as a descriptive method for the sciences. *Dialectics of Nature* is thus more a logbook of discoveries and observations during his search than the blue-print of a "New Doctrine". It is therefore our task to continue this search in order to reach a sharper definition of the problems and to develop further the steps to understanding the role of the various spheres of nature (non-living, living and thinking matter) within socio-economic power structures.

3. THE STAGE OF INTERPRETATION

3.1 Lenin and beyond

In the tradition of the socialist movement the critique is one of the strongest weapons in the development of new ideas. Critique in the dialectical sense has a twofold meaning: it is not only analysis and an attack on faulty or hostile theses, but the attack itself is also a means towards further understanding: it is the unity of goal and means. But when the worries of daily politics determine the agenda, we see that critique is not always constructive. Lenin's *Materialism and Empiriocriticism, Critical Comments on a Reactionary Philosophy* is a good example of a polemic which was dictated by a defensive action within an inner-party struggle. This book, written in 1908, is an incredible achievement. Lenin succeeded in writing in a very short time an attack on the ever more popular neo-positivist currents in philosophy of science and its neo-Kantian elements. Lenin attacked an idealistic current within the Russian Social Democratic party, which based itself among other things on the newest developments in natural science and the latest fashion in philosophy of science. Lenin saw in the new philosophical trends, as Korsch has

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33) Anti-Dühring, p.54.

34) Engels spends much time and pleasure in the fight against spiritualism (which has a great tradition in the U.K.), visits seances and discusses also the spiritualistic leanings of Newton, for long smoothed over in official scientific canonizations.

remarked [35], ideologies that could damage the central directions of party activities. Therefore his attack is hard and without nuances, which is the source of much later dogmatism.

The natural sciences underwent essential changes at the beginning of the 20th century. After a stage of unbridled success in the 19th century, classical mechanics appeared to have reached its limits. With atomistic statistical mechanics, probability theory invaded the "hard" sciences. With the theory of relativity (which is still a classical theory) fundamental notions such as simultaneity were brought up for discussion. The biggest blow came with quantum mechanics, about which feelings run high even today. There was much confusion within the scientific world concerning the new breakthroughs. Misinterpretations of the real content of the new theories was the order of the day. One cannot blame Lenin for not understanding in 1908 the range of the new developments (most physicists didn't either). The weakness of Lenin in *Materialism and Empiriocriticism* however is that:

1) he does not place Engels' *Anti-Dühring* in its historical context (as everybody failed to do in the Second International) but uses it as a work of definitive authority.

2) in his attack on the Austrian inspirer of later neo-positivism, Ernst Mach, he overlooks essential aspects. Mach for instance was one of the first who pointed out the historicity of formation of physics theory [36]. In this respect Mach worked along the same lines as his contemporary Engels, a fact also stressed by Bayertz and Krohn. In addition Mach, as an experimental physicist and physiologist, took the material basis of human sensory perception as a starting point and therefore considered that every new discovery could in principle challenge the whole scientific edifice. Or as physicist Philipp Frank, whom Lenin characterized as a Neo-Kantian, puts it:

> For the investigator, every new theory that is supported by experiment is a piece of newly discovered reality. According to Mach, on the other hand, physics is nothing but a collection of statements about the connections among physical perceptions, and theories are nothing but economical means of expression for summarizing those connections. "The aim of natural science is to obtain connections among phenomena. Theories, however, are like withered leaves, which drop off after having enabled the organism of science to breathe for a time. " (Die Geschichte und die Wurzel des Satzes von der Erhaltung der arbeit. 1871) [37].

In *Materialism and Empiriocriticism* Lenin did not go beyond the strict realist position, that real nature exists outside humankind. Lenin took a clear ontological point of view contrary to epistemological theories that see the human capacity for describing and knowing nature only as a mental construct (whether socially mediated or not). For Lenin, physical reality is an a-historical reality which in the course of history, in line with different ruling ideologies, is being described and understood. Lenin stresses, in line with Engels, the so-called mirror or reflection theory. This conceives of reality as a more and more complete and comprehensive picture reflected in the human mind as the result of the continuous actions of human thinking and acting. Lenin links up in fact here with Platonism (with the big difference that for Lenin the pictures on the wall reflect realities and not idea's). Lenin's political reasons for such a stand are evident.

What political day-dreaming would not be unleashed if even the hard sciences are only temporary theories which can be abandoned whimsically? What if the class struggle and exploitation are not solid social realities (which have to be changed by concrete social action), but only working hypotheses? The background of Lenin's attacks and his malevolent reading of Mach overshadowed completely the real scientific and philosophical aspects [38].

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35) Karl Korsch. "The Present state of the Problem of Marxism and Philosophy" (1930), In: Marxism and Philosophy, MR Press, New York, 1970, p.125.

36) Especially in: Ernst Mach, The Science of Mechanics. A Critical & Historical Account of its Development. Open Court, Lasall. Il, 1883. Sixth edition, 1960.
For the further developments in physics Mach's famous criticism on idealistic absolute space and time turned out to be crucial for the development of the special and general theory of relativity. Mach accepted only real interactions between real bodies. That way Mach's approach can be interpreted as a historical break with metaphysics and an expression of 19th materialism where only real existing and tangible objects are accepted. (see: The Science of Mechanics, pp.271-305.)

37) Philipp Frank. Modern Science and its Philosophy. Harvard U.P 1950, p.62.

38) Historically it is also important that Mach aligned himself so closely with American pragmatists such as William James and John Dewey, who express modern hit-and-run capitalism in which theories are only practical instruments for short-term results. Where Mach takes the limitation of human sensory perception as a starting point, the pragmatists go

Just as with *Anti-Dühring*, *Materialism and Empiriocriticism* is a salvo in a power struggle on the future course of a political movement. Unfortunately both books played an important role in the totally different world of the later Soviet Union. It would go too far here to dwell in detail on the social background and the further deterioration of the discussion on the relationship between humans and matter in the Soviet Union. Immediately after the 1917 revolution many interesting discussions took place, a large part of which unfortunately remains unknown [39].

In the Stalinist counter-revolution creative development was stopped and replaced by a state religion: Dialectical Materialism (DIAMAT), in which Engels' *Anti-Dühring* and Lenin's *Materialism and Empiriocriticism* degenerated to catechisms of super-human proportions. The most important feature of DIAMAT is that dialectics is seen as the foundation of nature. Consequently the true laying bare of the riddles of nature and consequently society reveals dialectical relations. As Negt says:

> Nature organizes herself not, as with Marx, as historical Praxis, but the other way around: the historical Praxis becomes an ingredient of the natural relation [40].

In fact, classical logic is replaced by a dialectical logic and for the rest nothing changes. Existing science is only described in other terms without being able to provide the slightest indication of a practical superiority. In that sense it is philosophy of the worst kind [41].

After the Second World War the situation deteriorated even further with inquisition-like unscientific excesses in agro-biology with the theories of Lysenko, in the discussion on quantum mechanics, in the discussions on continental drift, etc. A central thesis in DIAMAT is that because everything in nature (in a "behaviouristic" way) can be described as an interaction between oppositions, this "materialistic" sub-structure expresses itself directly in social processes. Formal logic is replaced by formal dialectics, at the level "fire plus water gives steam". Because Stalinism raised this primitive theory to state religion, it is understandable that many anti-Stalinist forces threw the fundamental materialist characteristics of the historical materialist child away with the DIAMAT bath-water. A second feature of the Stalinist tradition is the thesis that the stage of so-called proletarian science (which supposedly had already been reached in the Soviet Union) implies an organic unity of theory and practice, which should produce science which directly serves of the building of the Soviet Union and should be superior with respect to ivory tower science "in the service" of capitalism [42].

An important aspect of developments in the Soviet Union is that immediately after the revolution there was considerable emphasis on the planning of science and technology in order to exploit the progressive character of the development of the means of production as much as possible. Nikolai Bukharin was one of the driving forces in this process [43]. This beautiful endeavour led in short order to debacles, because political priorities, unimpeded by any professional reflection, began to determine the organisation and priorities of scientific research [44]. Here we see how the claimed achievement of the unity of theory and practice simply becomes a voluntarist political tool in the rulers' hands.

3.2 The de-materializing of nature

At the end of 1922, the Hungarian philosopher and communist György Lukács published the collection *History and Class Consciousness*. This work had an enormous influence, and enjoyed a grandiose

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much further and take that theory as correct which best fits the given circumstances. See also: George Novack; Pragmatism versus Marxism, Pathfinder NY, 1975.

39) David Joravsky. Soviet Marxism and Natural Science 1917- 1932, Columbia UP. New York, 1961.

40) Oskar Negt, "Introduction" in; Abram Deborin-Nicolai Bucharin, Kontroversen über Dialektischen und Mechanistischen Materialismus. Suhrkamp Verlag, Frankfurt a.M., 1969, p.37.

41) In Newtonian theory light is composed of particles, within the Maxwellian theory of waves, and in quantum mechanics light manifests itself either as particles or as waves (but never both together). So we are not yet at the end of the story (unless you like the Niels Bohrs complementarity theory, that indeed in reality "the buck stops here"). The DIAMAT solution, that quantum mechanics is just a brilliant proof of the dialectics of nature, does not "solve" (not to say "transcend") the quest, but "dissolves" it in an effectless reformulation.

42) One should again have the persistency and enthusiasm of an F. Engels to bite through this rotten and very thick apple. Within history of science the best overview is given by: Loren R. Graham. Science, Philosophy and Human Behaviour in the Soviet Union, Columbia UP. 1987, New York. For an extensive bibliography see: Loren R. Graham. Russian & Soviet Science & Technology. History of Science Newsletter Vol 18 (1989)#4.

43) Loren R. Graham. Bukharin and the Planning of Science. The Russian Review, 239(1964) pp.135-148.

44) See e.g.: Paul. R. Josephson. Physics and the Politics in Revolutionary Russia. Univ. of California Press, Berkeley, 1991.
Bruce Parrott. Politics and Technology in the Soviet Union, MIT Press, Boston, 1983.

rediscovery in the sixties. Lukács, who chose the side of the proletariat soon after the Russian revolution, and who played an important role in the Hungarian soviet republic of 1919, developed himself as one of the most important and influential philosophers of the left. *History and Class Consciousness* was his first collection of philosophical essays after his departure from bourgeois philosophy in the 1920s. Later he would renounce this pioneering work under pressure of the party, only to return to the standpoint of his youth at a very old age. In the preface of the republication in 1967 Lukács declares:

> Above all I was absolutely convinced of one thing: that the purely contemplative nature of bourgeois thought had to be radically overcome. As a result the conception of revolutionary praxis in this book takes on extravagant overtones that are more in keeping with the current messianic utopianism of the Communist left than with authentic Marxist doctrine [45].

His biggest self-criticism in 1967 is his underestimation of the economic sub-structure.

> I just confine myself here to a critique of *History and Class Consciousness* .... In my book this deviation has immediate consequences for the view of economics I give there and the fundamental confusions result, as in the nature of the case economics must be crucial. It is true that the attempt is made to explain all ideological phenomena by reference to their basis in economics but, despite this, the purview of economics is narrowed down because its basic Marxist category, labour as the mediator of the metabolic interaction between society and nature, is missing [46].

The most important conclusions on the nature of Marxism, he maintains in 1967, lie in the essay *What is Orthodox Marxism*:

> The introductory comments in the first essay, for example, give a definition of orthodoxy in Marxism which I now think is not only objectively correct but also capable of exerting a considerable influence even today when we are on the eve of a Marxist renaissance. I refer to this passage: "Let us assume that recent research had proved once and for all that every one of Marx's individual theses was false. Even if this were to be proved every serious 'orthodox' Marxist would still be able to accept all such modern conclusions without reservation and hence dismiss very single one of Marx's theses- without being compelled for a single minute to renounce his orthodoxy. Orthodox Marxism, therefore, does not imply the uncritical acceptance of the results of Marx's investigations. It is not the 'belief' in this or that thesis, not the exegesis of a 'sacred' book. On the contrary, orthodoxy refers exclusively to *method*. It is the scientific conviction that dialectical Marxism is the road to truth and that its methods can be developed, expanded and deepened only along the lines laid down by its founders. It is the conviction, moreover, that all attempts to surpass or 'improve' it have led and must lead to over-simplification, triviality and eclecticism" [47].

Lukács expresses in *History and Class Consciousness* his break from romantic idealism and elaborates in a brilliant way on the social preconditions for human emancipation [48].

As a connoisseur of classical German philosophy, he emphasises the transcendence of Hegel by Marx. He is one of the first to criticise Engels for his conceptions of the role and place of nature. Lukács emphasises the active role of the proletariat in the social struggle. For him, historical materialism is a social theory, which makes possible the understanding of historical developments in terms of class struggle and therefore is able to end human misery. Consciousness and alienation are social processes. It is humankind that makes the world.

> Thus man has become the measure of all (societal) things. The conceptual and historical foundation for this has been laid by the methodological problems of economics: by dissolving the fetishistic objects into processes that take place among men and are objectified in concrete relations between them; by deriving the dissoluble fetishistic forms from the primary forms of human relations. At the conceptual level the structure of the world of men stands revealed as a system of dynamically

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45) G. Lukács. History and Class Consciousness: Studies in Marxist Dialectics, transl. Rodney Livingstone. MIT Press. Cambridge, Mass., 11th printing 1988. p.xviii.

46) Ibid. p.xvii.

47) Ibid. pp.xxv/xxvi.

48) See for the development of Lukács in this period: Michael Löwy, Georg Lukács - from Romanticism to Bolshevism, NLB, London, 1979. For an autobiographical retrospective: Georg Lukács: Record of a Life, Verso London, 1983.

changing relations in which the conflicts between man and nature, man and man (in the class struggle, etc.) are fought out.

And further on:

> History is no longer an enigmatic flux *to which* men and things are subjected. It is no longer a thing to be explained by the intervention of transcendental powers or made meaningful by reference to transcendental values. History is, on the one hand, the product (albeit the unconscious one) of man's own activity, on the other hand it is the succession of those processes in which the forms taken by this activity and the relations of man to himself (to nature, to other men) are overthrown [49].

Lukács' objective is to show that human activities, including thinking, have a social context. He attacks Engels, where Engels speaks of thoughts as reflections of real things (a line Lenin carries through to the extreme). For Lukács human action and all knowledge are socially mediated. His critique of Engels goes much further than that of the already mentioned philosopher and revolutionary Karl Korsch, who kept up the materialism of Engels. The importance of the formal dialectics of natural processes with which Engels toys in *Anti Dürhing* (*Dialectics of Nature* was still unknown during the writing of *History and Class Consciousness*) he disputed as follows:

> Nevertheless, Hegel does perceive clearly at times that the dialectics of nature can never become anything more exalted than a dialectics of movement witnessed by the detached observer, as the subject cannot be integrated into the dialectical process, at least not at the stage reached hitherto. Thus he emphasises that Zeno's antinomies reached the same level as those of Kant, with the implication that it is not possible to go any higher. From this we deduce the necessity of separating the merely objective dialectics of nature from those of society. For in the dialectics of society the subject is included in the reciprocal relation in which theory and practice become dialectical with reference to another. (It goes without saying that the growth of *knowledge* about nature is a social phenomenon and therefore to be included in the second dialectical type.) [50]

Lukács stressed without reservations:

> Nature is a societal category. That is to say, whatever is held to be natural at any given stage of social development. However this nature is related to man and whatever form his involvement with it takes, i.e. nature's form, its content, its range and its objectivity are socially conditioned [51].

Here we see most clearly where Engels and Lukács diverge. For Engels nature is, in its universal form as 'non-living matter in motion', fundamentally intelligible by a dialectical analysis of mutually interpenetrating forces. The objective dialectics of nature is underwritten by Lukács. For Engels however it is this dialectics which we find again in transcended form in inter-human relations. For human characteristics are the result of the dialectics of non-living matter in the sense that the high level of complexity (the enormous quantity of organisation) transcends its own mechanical structure and gives way to the new quality of life: a quality with an own dialectics.

For Lukács knowable nature is only the immediate nature around us, the eco-structure, which people through their existence and actions shape and mould. For him social dialectics has by no means any relationship with the 'dialectics of nature'.

Here we reach an crucial problem. In reducing non-living matter to nature-around-us, nature indeed turns out to be only a social product of human labour. What is being omitted here is the analysis of the material basis, nature-as-matter-in-motion. In fact, Lukács states that non-living matter is completely intelligible in principle (behaving according to laws which are knowable by humans) and so an objective category. Lukács accepts that natural forces have a formal dialectical structure, but declares this outside the subject under discussion. Nature, not yet known by humanity, is placed outside historical materialism. The notion of non-living matter then however becomes an objectified (be it not yet known) thing, where it is left to the natural sciences to see if formal logical or dialectical methods bring us further in the "revealing" of reality. The physical (not yet socialized) basis of human existence is therewith thrown out. An untenable thesis which implies a dualism of method, which is difficult to

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49) Ibid. p
p.185-186.

50) Ibid. p.207.

51) Ibid. p.234.

square with Lukács' own cherished thesis that Marxism is the only method towards truth.

3.3 Gramsci's critique

Antonio Gramsci reacted fiercely in his critique on Bukharin against the idea of the existence of an objective nature with knowable, eternal features which is so to say slowly peeled open by science until the kernel of truth is uncovered. Nikolai Bukharin and Eugene Preobrazhensky present nature in their popular *The ABC of Communism* as a tamable object that will be completely knowable after the socialist revolution:

> Concurrently with the disappearance of man's tyranny over man, the tyranny of nature over man will likewise vanish. Men and women will for the first time be able to lead a life worthy of thinking beings instead of a life worthy of brute beasts [52].

This popular book with its sub-title "A popular account of the program of the Russian Communist Party" was written in 1919, i.e. during the war of intervention, as a simple introduction to a new policy. In his speech to the London congress of 1931 on the history of science and technology, Bukharin formulated the problem as follows:

> The crisis in modern physics- and equally in the whole of natural science, plus the so-called mental sciences (Geisteswissenschaften)- has raised as an urgent problem, and with renewed violence, the fundamental questions of philosophy: the question of the *objective reality of the external world*, independent of the subject perceiving it, and the question of its *cognisability* (or, alternatively, non-cognisability) [53].

For Bukharin the criterion of truth is practically instrumental, which is difficult to reconcile with his critique (borrowed from Lenin) of the neo-positivists.

> The fundamental criterion of correctness of cognition is therefore the criterion of its adequateness, its *degree of correspondence* to objective reality. The instrumental criterion of truth is not in contradiction to this criterion but *coincides* with it, if it is only a question of an instrument for the practice of social man (Marx's "revoltionäre Praxis", Engels' "umwälzende Praxis"), and not of the individual "practise" of any philistine in a beershop [54].

Gramsci attacked both contributions of Bukharin sharply in his *Prison Notebooks*. Gramsci's critique can be best summed up with the following quotation:

> However, if one analyses this idea it is not all that easy to justify a view of external objectivity understood in such a mechanical way. It might seem that there can exist an extra-historical and extra-human objectivity. But who is the judge of such objectivity? Who is able to put himself in this kind of 'standpoint of the cosmos in itself' and what could such a standpoint mean?
>
> Man knows objectively in so far as knowledge is real for the whole human race *historically* unified in a single unitary cultural system. But this process of historical unification takes place through the disappearance of the internal contradictions which tear apart human society, while these contradictions themselves are the condition for the formation of groups and for the birth of ideologies which are not concretely universal but are immediately rendered transient by the practical origin of their substance. There exists therefore a struggle for objectivity (to free oneself from partial and fallacious ideologies) and this struggle is the same as the struggle for the cultural unification of the human race [55].

Gramsci attacks correctly the mechanical tendencies of Bukharin, but just as with Lukács he evades the problem of the physical-biological sub-structure of the human capacity for thinking and acting.

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52) N. Bukharin and E. Preobrazhensky. The ABC of Communism. Ann Arbor Paperbacks, The Univ. of Michigan Press, 1966. p.77.

53) N.I. Bukharin. "Theory and Practice from the Standpoint of Dialectical Materialism", in: Science at the Cross Roads: Papers Presented to the International Congress of the History of Science and Technology held in London from June 29th to July 3rd 1931, by the delegates of the USSR. KNIGA Ltd, London 1931. p.1.

54) Ibid. p.8.

55) Antonio Gramsci. Selections from Prison Notebooks. Lawrence and Wishart, London, 1973, p.445.

3.4 Alfred Schmidt

In the sixties in western Europe strong sociological currents developed in opposition to DIAMAT, which took alienation and human communication as central themes. Remarkably but as with Lukács and Gramsci, the exponents of this current showed little if any knowledge of the real state of the art in contemporary science and medicine. Unlike Engels and Marx, the study of science and technology was not seen as a precondition to put science and technology in a social context. A fashionable book was the work of Alfred Schmidt on the concept of nature in Marx's work. The first chapter deals with the non-ontological character of Marx's dialectics according to Schmidt and reaffirms Lukács' thesis in *History and Class Consciousness* that we are "only" dealing with a method. In the second chapter Engels gets the full treatment, as if in Marx humanity and nature interpenetrate one other, whilst in Engels they are artificially separated.

> While in Marx's work nature and history are closely intertwined, Engels sees them as two separate fields of application for the materialist method. The dialectical moments are detached from their concrete, historical content, and are shoved together into the framework of the three reified "fundamental laws" of the "dialectics of nature", which are superimposed on reality. Thus dialectics becomes what it was least of all for Marx: a world-view, a positive, univeral principle.[56]

A very important element in this kind of "sociologizing" of nature is that the "simple" interactions of nature are posed as contrary to the "higher", dialectical interactions of human society. That there exists a "reality" outside us (Lenin's obsession) is irrelevant, as all activity is social activity. Outside this social activity it is impossible to pass any judgement.

> Without human efforts to master nature, the concept of natural law is unthinkable.[57]

The statement that all the knowledge we have of non-living nature (translated in laws) is humanly determined is of course not the point of the discussion. There remain two major problems.
1) The negation of an ontological basis by "lifting" the material basis out of the discussion makes it very difficult to understand things like brain operations and psycho-somatics, not to say gene manipulation, without considering non-living nature as a god given meccano box.
2) It is of course putting things upside-down to interpret things in such a way that human emancipation abolishes the problems of evolutionary constraints along with alienation. Nature does not only appear as mediated in our thinking, it determines this very thinking to a large extent. These borderlines are given to us by evolution and are subjects for further research. Wanting to know and researching not-yet-known (and therefore not-yet-socialized) knowledge is one of the charming features of human beings, the basis of science, and a tool for the process of making the world.

4. BACK TO MATERIALISM

In this last section an attempt is made to structure the next round of the discussion.

1) Human existence is wrapped in a structure of non-living, living (but not thinking), and thinking matter. For certain (still unclear) reasons, under certain conditions, complex structures may emerge, which first give rise to the life of plants and animals and subsequently to human life. Theories of this development fall into two categories: either the cause is sought externally (fors vitalis, god, etc.), or there is a theory created by human thought wherein certain experimental (sensory perceptive) categories can claim causality (as e.g. the tendency to minimum energy, or the tendency to maximal entropy).

If we start from an external cause that we don't know, then it is only possible to wait until it declares itself, or to make the best of what is seen as the agent of that external force (rain dances, images of saints, the god-king, the holy-father, drugs, etc.).

If on the contrary we start from what we do know, what we can analyze and from which we can apply the results, than the problem is to construct theories which, within their domain, take us further in the conscious shaping of our world. It is in this line of independent and self-assured scientific work that Marx and Engels, contrary to the "utopian socialists" (who wanted to change the world with good will)

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56) Alfred Schmidt. Der Begriff der Natur in der Lehre von Marx. EVA, Frankfurt a.M. 1971. p.53. Translation by Robert Went.

57) Ibid. p.66.

wanted to take the fate of humankind (and its environment) out of the hands of incomprehensible "natural forces" and into the hands of humanity itself. The makability of the world is a human-made cause. Therefore economic power structures between people should be understood as including their "alienating" elements as well as the relationship with non-thinking and non-living matter and the humanity's roots in nature.

2) The human capacity for thought is an evolutionary development and a result of ever more complex forms of matter (from a simple atomic nucleus to a DNA molecule). The more and more complex organization of matter is expressed in the new quality of thinking. The unique feature of the human mind is that it is able to distance itself from itself as well as its environment, and to create an image. This image making can than be transformed into language and concepts. These in their turn are then further objectified in notions, which make the establishment of connected theories and experiments possible. Image formation is thus, within the given conditions, refined and changed. In this sense, all knowledge of nature is indeed social knowledge. Within every social frame of reference the thinking capacity expresses itself according to the current hegemonic rules. Research on this subject is still very young. During the -in geologically terms- extremely short period that humanity has been performing systematic research on its own thinking processes, not very much has yet been achieved (although all the more claimed). We see e.g. that climatic conditions not only have a strong influence on the economy (this is among other things part of the studies on the production modes in e.g. Asia, in contrast to the West European traders' economy), but also on language systems. The study of the differences between iconographical languages such as Chinese and the alphabetised languages is important for finding out how humans store abstractions mentally and achieve theory formation [58].

3) With the naming of a thought or experience the (language/speech -less) thought becomes a concept; a manipulatable notion comes into being [59]. It is an enormous step in every science if a phenomenon gets a name. This is something that fascinated Engels and Marx. At the moment that the notions "cell" and "division of cells" appeared, whole areas of biology became understandable and exploitable for research. This is just the same with the notions of energy, enthalpy and entropy in thermodynamics which are essential for the development of the steam engine. At the moment that, e.g., the chemical elements are classified in the periodic system, an enormous development emerges in chemistry [60]. The use-value of a concept or notion in inter-human relations is that it is usable for the satisfaction of needs for communication and accumulation of knowledge. In a capitalist society knowledge is not only use-value, but also exchange-value and therefore a means of power, and language becomes a weapon in the power structure [61].

4) The difference between (speech) utterances in daily human intercourse and the language of science is that the latter is more formalised. This formalization in fact is only fully reached in mathematics. In the natural sciences notions are often dependent on context [62]. The remarkable thing now is that all these historically changing scientific notions nevertheless lead us to tangible and reproducible results. In spite of the differences between the various theories, kitchen-salt remains the same and the sun rises in the morning. It is then historically more true that the earth rotates around the sun instead of the sun around the earth; the fact that both turn around their common centre of gravity (ignoring all other heavenly bodies) doesn't change anything in our perception of day and night. We reach here an extremely important problem: the epistemological aspects of emancipatory thinking. First of all we have to establish that certain phenomena are real, irrespective of theory (we see that a stone falls towards the earth in Aristotle's mechanics, in Newton's, and in Einstein's, in spite of the totally different explanations

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58) The difference in iconography and alphabet is also expressed in the development of calculating systems with direct effects on economic dealings. See e.g. Dirk J. Struik, A Concise History of Mathematics, Dover, New York, 1967.

59) Already in the twenties Vygotsky had begun pioneering research along these lines. Lev Semenovich Vygotsky. Thought and Language. MIT Press, 1962. See for an excellent review of his work: James V. Wertsch, Vygotsky and the Social Formation of Mind, Harvard Univ. Press, 1985. See for a more cultural biography: Alex Kozulin, Vygotsky's Psychology, A Biography of Ideas, Harvester Wheatsheaf, New York, 1990.

60) All classical theoreticians of Marxism, who see the practical value of this kind of concept formation and systematization, consider this as a clear illustration of a dialectical quantity-quality transition and vise-versa. See also Trotsky when he discusses Mendeleev, the discoverer of the periodic system of the chemical elements, in his speech: Dialectical Materialism and Science, in: Leon Trotsky. Problems of Everyday Life, Monad, New York, 1979.

61) For language and exchange-value see: Ferruccio Rossi-Landi, Linguistic alienation problems, A Cooperative Inquiry. Semiotica, 88(1992) 1/2, 158-181.

62) The sodium atom is the smallest unit of the element sodium. In crystalline form we can describe it as a point charge. In the gas phase in a so-called Rydberg state it has the size of an amoeba, so "what's in a name?"

the theories provide for this fact) [63].

The question now is if there is a reality outside humanity which can be "revealed", in other words: has non-living nature knowable (revealable, human-independent) properties, expressible in laws, which can become known and asymptotically dominated by humankind? Can "nature" ever become (for instance in a communist society) completely social? If this is the case (as e.g Bukharin claims, but also Gramsci and even Marx lean towards that idea, as Grundmann proves) than it is "only" the problem of establishing the best possible social order. In simple words: that nuclear power under workers control would be safer than under capitalism or a bureaucratic dictatorship.

5) One of the most difficult and remarkable features of a workable theory is that it is able to provide applications and predictions based on elementary notions and a internal formal consistency. Within bourgeois philosophy of science whole tribes wage war to formulate this phenomenon correctly. For us it is not important to check which theory is "true" in the sense of standing outside humanity, that is, eternally true, as a replacement for religion. All theories are human approximations of natural phenomena. Theory formation is an historical process and is never closed. One or more holes in it doesn't kill a theory within its area of application. The a-historical declaration of being true for a theory is senseless.

The most astonishing (or really the most truly and human) fact is that human thought is able to develop completely new and more encompassing concepts and theoretical connections which describe an ever growing number of real phenomena in a comprehensive structure of notions.

6) We now reach the concept of reality and the extent to which human thought can understand this reality and therefore consciously change it. As has been said before the "sociologizing" of nature doesn't solve much. Heredity is in the genes although we don't know yet how it first got in the genes, and how new life emerges out of it again. The battle between classical Darwinism and various adaptation possibilities is far from over. Psychopharmacology, modern molecular biology, and the possibility of manipulating (human) offspring make it very difficult to continue taking the Cartesian split between mind and matter seriously. Apparently the human mind is able to describe adequately, within certain limits, real processes in non-living and living matter. It is therefore very tempting to return to Lenin and his concept of reality [64]. The essence of Platonic reality is that reality in all its complexity (trans-historically) exists, but that humanity is only able to obtain an impression of it, as in an unsharp print of a photograph. Science moves slowly and approaches reality asymptotically, after much searching and trying . In Lenin's terms the reality outside of us is reflected in our thinking. Just here is the crux of the problem and why Lenin's thesis becomes untenable. The assertion of a reality outside humanity is not very exiting; rather, it is remarkable that so many philosophers continue to speculate on its non-existence (even if it was before a so-called moment of creation). For historical materialism and its founders there never was a problem of materialist ontology, although the concept of matter has changed and mass (matter in the 19th century sense) and energy are now united in an object we call the energy-momentum tensor [65]. The problem is the knowability of reality and thus its social usefulness for humanity in designing its living space. Historically we see that this knowability changes fundamentally with every "scientific revolution" and starts again on a completely new footing. The historicity of knowledge does show us that more phenomena are lumped together, but doesn't say anything about the greater "reality content" of one theory as opposed another, or anything about the expectation of life of a theory [66].

7) The only way to work for a genuine transcendence of reductionist determinism is not by denying but by taking seriously the material basis of humans and to take this as basis for human socializing. Discarding mechanical reductionism doesn't mean discarding the biological, i.e. material basis of humans. If human procreation was differently structured, power questions between men and women (e.g. on childcare) would be expressed differently. Human knowledge of nature is not a reflection of a cut and

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63) These types of realities holds equally for human inventions such as the steam-engine or the nuclear power plant, which exist independently of the hegemonic theory or the actual social system. See also Grundmann's discussion on technology, ibid. chapter 3.

64) It is remarkable that for just these reasons the eminent mathematical physicist Roger Penrose in his: The Emperor's New Mind, Oxford UP. 1989, almost compulsorily reaches the conclusion of a Platonic reality behind modern physics and mathematics.

65) Dominique Lecourt is moving in the right direction when he states that Lenin doesn't take as fundamental one or the other form of matter but the philosophical category matter. Unfortunately neither he nor Lenin goes much further than this assertion. Dominique Lecourt. Une Crise et son Enjeu, François Maspero, Paris, 1973.

66) The philosopher of science Paul Feyerabend was one of the few who stressed this aspect continuously. E.g. Paul Feyerabend. Realism and the Historicity of Knowledge. The Journal of Philosophy. 86(8), 1989, p.393-406.

dried reality on the human mind where the picture is slowly filled in historically like a photo in a developing tray. Human thought is a function of the brain structure. Thinking is transcending lifeless complexity and this in the classical dialectical sense of a continuation as well as a negation. This "material" fact we encounter with every birth, as complex non-living matter is transcended into living-matter in the mother's womb and transcends further into an independent living and thinking being. This independent, thinking, conscious human action makes use of the existing historical and cultural possibilities and co-creates economic reality. With the growth of the surplus-product, the division of labour, and the birth of art, science and technology, continuously more refined language and communication develop. Ever more abstract notions become operational and hence gain reality value. Not only do notions such as photon or labour-power become realities, well defined 'linguistic use-values', humankind develops in its creative labour a workable image of the world, a picture which enables it to change and mould the world. The manifest successes of theories (e.g. electrodynamics) verbalised in so-called laws of motion is an expression of reality in terms of our actual cultural level.
Contrary to Lenin (and so many others), reality outside humanity is not a fixed entity that can be revealed, but a reality which develops as a function of human productive labour and thus of the development of humanity itself. We stress the growth of the richness of reality as result of the human development. In this sense the different approaches of Engels and Lukács can be understood better. Where Engels in reaction to idealistic currents stresses the reality of non-living matter as the basis of human existence, Lukács attacks the defenders of a knowable, pre-given construction outside humanity, a building which is just waiting to be opened. Just because human thought is the expression of an complex organisation of matter -a result of an evolutionary process- human labour enables it to analyze and change itself as well as the world (depending on the current production and hence cultural level). This reality is where political and scientific choices must be made. Bourgeois philosophy, in which humanity and matter are put in opposition to each other, doesn't have a structural place for the unity of nature in the sense of the unity of the eco-structure and humanity. Only an historical materialism that appreciates human thought and action as a (transcended) expression of the organization of its material sub-structure, as well as in relation to all other non-human creatures in the plant and animal world, is actually able to give form and substance to a conscious transformation of the world: a making of the world that does not merely treat symptoms, but designs and steers processes.

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