

**THOMAS HOBBS AND THE IDEA OF MECHANICS IN
SOCIAL SCIENCES AND ETHICS**
Some preliminaries in the history of the idea of mechanics

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1. Introduction

For a large part the popularity and unpopularity of Hobbes's philosophical work in the past relied on his radical programme. In it the idea of mechanics, an idea of scientific investigation becoming more and more successful in Hobbes's age, had a central place. The originality of Hobbes was that he applied the modern conceptions of motion, force, cause and effect among others to human nature and society. One should not avoid admiration for this realisation, whatever the view about the consistency of Hobbes's philosophical work. For the first time human nature and society were merely seen as the product of nature, and rules of behaviour and knowledge were only based on nature. Hobbes broke with religious thoughts in which transcendent values were supposed to be at work both in man and society. In my opinion his work lacks consistency, but as this was overlooked most of the time by Hobbes's intellectual followers, his mechanistic ideas kept influencing social and moral philosophy in the 18th and 19th centuries. Mechanistic conceptions remained very influential in the early beginnings of social sciences.

So we are confronted both with the problem of content (and the continuity of content) of the idea of mechanics in social sciences and ethics, and the problem of the mythical, deforming character of that idea. One can not expect us to render a full and complete overview of this subject of importance for the history and philosophy of sciences. In this paper I intend merely to give some starting-points for a further investigation of the idea of mechanics, for which the work of Hobbes is serving as a penetrating and inspiring basis. Until now the history of science lacks an investigation of the 'mechanistic

program' in social sciences, for most of the time importance was given to the so-called methodological debate or to social sciences seen as theories of action. With this paper I shall try to fill the gap and to draw the main lines of a future research programme that I intend to accomplish.

In section two I shall recall the general outlines of Hobbes's mechanistic thoughts as they appeared in his philosophy of human nature and his social philosophy. This obliges me to give the outlines of the phenomenon called the mechanization of the world-picture¹. In section three I shall scetch the downfall of Aristotelian teleologism, swept away by the mechanistic conception, which led to the birth of the scientific myth in social philosophy. This myth has to be pictured as clear as possible for future research will rely on it. Reasons must be put forward to show that it is rightly called a myth. Section four treats the history of the idea of mechanics in social sciences and ethics in a preliminary way. Some important examples of the mechanistic conception will be given, without being complete however. Linked with it I shall scetch the methodological debates one can imagine when speaking of the influence of the idea of mechanics. Problems of fertility and infertility, analytic and synthetic power of that idea show up to have importance for the discussion of the criteria for the evaluation of scientific progress. I shall conclude my paper in suggesting further items of research, pleading for a status quaestionis of the idea of mechanics in social sciences and ethics.

2. *Hobbes's mechanistic thoughts.*

Hobbes's legacy towards social and political philosophy was undoubtedly the scientific, man-centered treatment of political and moral problems. So he was responsible for a revolution in philosophy, that marked the beginning of the decay of theological philosophy. In the introduction to his *Leviathan*, Hobbes said :

Nature, the art whereby God hath made and governs the world, is by the *art* of man, as in many other things, so in this also imitated, that it can make an artificial animal. For seeing life is but a notion of limbs, the beginning whereof is in some principal part within; why may we not say, that all *automata* (engines that move themselves by springs and wheels as doth a watch) have an artificial life? For what is the *heart*, but a *spring*; and the *nerves*, but so many *strings*; and the *joints*,

but so many *wheels*, giving motion to the whole body, such as was intended by the artificer ?²

In this introductory words and in the first chapter of his *Elements of Philosophy, First Section, Concerning Body (De Corpore)*, Hobbes's made clear what his 'philosophical radicalism' intended to be. Philosophy is the global art of computation and its utility consists in 'reckoning up the chief commodities of which mankind is capable'. His whole philosophy was moulded in a programme of study of bodies and motion. To begin with nature, to continue with human nature, and to end with the scientific study of commonwealth, those where the elements of Hobbes's system of scientific philosophy. We do not need a full recapitulation of these elements for they are both well-known and frequently treated in the Hobbian literature. I shall concentrate on the crucial moments of Hobbes's scientific philosophy : namely his closed system of empirical philosophy aiming at correct and indisputable deduction of the conceptions about both the human and the societal mechanisms (or automata, as Hobbes called them). We will see that in it Hobbes was one of the first in an ever growing set of philosophers and social scientists seeking *the complete construction of world, human being and society on rationalistic basis, by means of an impoverishing model-building style of thinking*. In this Hobbes was expressly a child of continental rationalism.

Moreover, Hobbes was the first to suggest, as we will see, that human being and commonwealth were the outcome of an ever on-going process of motion between corpuscles, leading to *equilibrium*. Scientific approach of human nature and society was identified with the search for the *deductive reconstructin* of these processes which end in equilibrium. Equilibrium, whatever the particular start of the process, should be held rational in that it could be reached at in a deductive reconstruction.

I shall call these beliefs of mechanics equilibrium and rational reconstruction in Hobbian philosophy, totalistic.³ I consider them as an expression of a mythical idea that results in a deterministic view of reality that is self-destructive. I considered it as one of the secularized versions of older deterministic (and theological) metaphysics. It is a *metaphysical closed system* in which *the supposed actual process of natural, human and social reality is identified with the rationally reconstructed process of that reality*. The actual process is thought rational for the reconstruction of the process is

done in a rational deductive way (or what stands for it); the reconstruction is considered rational for it corresponds with the actual outcomes of reality itself. One knows how influential this mode of thinking has been. But it is wrongly considered as only typical for Hegelian metaphysics and social philosophy. In fact it can be traced back to other endeavours of model building in contemporary philosophy of science and particularly philosophy of social sciences⁴.

One of the important questions concerns the way Hobbes succeeded in his so-called rational reconstruction. As one knows, Hobbes made use of the geometrical mode of exposition. So he pretended to provide for mathematical inferences. Consequently the questions are: did Hobbes succeed in the correct deduction of the human automaton from his starting-points, namely his materialistic, corpuscular metaphysics, and if so, at what price; can we consider the rational reconstruction of the human automaton as complete? These questions will be answered in the negative. Similar questions concerns the societal automaton: did Hobbes succeed in the correct deduction (if deduction it can still be called) of the commonwealth, from his starting-points, namely his individualistic social philosophy; can we consider the rational reconstruction of the commonwealth as complete? Again, both questions will be answered in the negative⁵.

The appreciation and evaluation of Hobbes's philosophical work is linked with the negative answers, mentioned above. Whatever my criticism of Hobbes's philosophy as the embodiment of a scientific myth and a secularized version of older deterministic metaphysics, I am not ready to conclude that his work is worthless. On the contrary one can, in spite of the criticism, demonstrate the fertility of Hobbes's 'philosophical programme'.

Hobbes's metaphysics of matter and motion had its psychological counterpart. As a monist he set himself the task to develop a theory of human mind and life in materialist terms. There is no difference between inanimate, animal and human life, when matter and motion is concerned. Hobbes differed both with Aristoteles and Descartes. The former stressed a gradation in nature: from inanimate to conscious organization, and he linked with it the idea of a final cause that binds creatures together. But in this universe, a definite difference existed between human creature and animal creature, between animal life and plant, between plant and rock. The particular feature of human life was mind. The latter attacked the Aristotelian

teleologicistic conceptions about nature and argued that animal life as well as plants, could be explained without recourse to finalistic explanations. Animals could be conceived of as machines. Hence, his problem was to differentiate between animals and human beings, for the latter had to be saved from mechanistic thoughts. Descartes invented his famous dualism in order to settle the question. Human beings are equipped with mind. For the greater part they are machine-like, but the final command rests with mind. Hobbes ignored this contradiction in human beings, in adopting a monist and materialist point of view. Everything is matter in motion, which means that Galileo's laws of motion apply to human, animal and inanimate life.

One should recall Hobbes's conception of method of philosophy: an anticipation of what Hobbes's famous pupil Jeremy Bentham called "Chrestomatics": the science of addition, subtraction, multiplication and division. Science seen as arithmetics, in the case of Hobbes amplified by the geometrical mode of exposition. All science is a question of definitions, and once definitions are reached at, reason can do his job. Hobbes held an analytical conception of philosophy, entailing a nominalistic point of view. Philosophy is the work of reason and reason is nothing but reckoning, adding, and subtracting, of the consequences of general names agreed upon for the marking and signifying of our thoughts⁵.

Together with this monist and nominalistic point of view, Hobbes's treated *the mind as matter moved by internal motion*. He got his inspiration from Harvey's study of the circulation of the blood (1628), in which the discovery of the principle of internal motion was formulated. From this it was a small, but bold and ingenious step to say that animal, as well as human life, was a form of internal motion of matter. All life, conscious or unconscious, was a form of internal motion of matter. Only the modes of internal motion of matter differed. This was Hobbes's radicalist philosophical credo, which provided him with the outlines of his influential scientific program. He conceived of philosophy on a scientific basis. And science was considered as conditional knowledge, for he thought, absolute knowledge by means of discursion impossible, the ultimate basis of knowledge being our sensations and the movements of external objects towards our senses. On sensations, memory, imagination and science was built. The latter consisted in a conceptual activity, namely in an arithmetic of names.

2.1. *Psychomechanics.*

Hobbes developed his ideas concerning psychic processes within his view on science, and scientific philosophy. He differentiated between science arising from the knowledge of causes and making use of demonstration, and science containing theorems provable for things, whose causes are in our power⁶. Hobbes accentuated the ideal of scientific knowledge : deductive knowledge, provable knowledge. Science is a question of theorems, general propositions, having truth or considered to have truth. It is as well a question of consequences arrived at by means of correct deduction. But knowledge concerns factual truth and this cannot do without accepting theorems about things experienced. This kind of knowledge can only be conditional; the construction of theorems from experience of consequences without knowing the causes, results in possibilistic knowledge. In the first type of knowledge (deductive, provable knowledge, from causes) one uses a priori demonstration. In the second type of knowledge (in physics for example) one uses a posteriori demonstration.

On the other hand, since the causes of natural things are not in our power, but in the divine will, and since the greatest part of them, namely the ether, is invisible; we, that do not see them, cannot deduce their qualities from their causes. Of course, we can, by deducing as far as possible the consequences of those qualities that we do see, demonstrate that such and such *could* have been their causes.

Physics is of the second type of knowledge, although in the demonstrations a posteriori one makes use of demonstrations a priori, namely mathematics, particularly geometry. Hobbes did not mention other scientific disciplines on the same level. He did not speak of physiology, nor of psychology. But he did say something concerning ethics and political philosophy. Hobbes considered them as a priori disciplines. Ethics and politics contain general propositions, which are provable. They consist in deduction from first causes, which are to be considered as generally accepted. So, discussion in ethics and politics can but consist in discussion about first causes and about the deductions from it. Hobbes limited ethics and politics to "let us suppose that..., what will follow from it?". He started not only to use an ideal type of knowledge (his scientific knowledge), but he began to use an ideal type of ethics and politics as well. In ethics and politics first principles are man-made, and from this Hobbes concluded that they must be the cause of the secondary principles and rules.

which could be arrived at by means of correct deduction. This sounds like a *petitio principii*. Principles can be man-made, but nevertheless they can be arbitrary, and they can be reached at in an unknown way. In saying that ethics and politics are *a priori*, Hobbes made it possible to identify a supposed actual process of human and social reality with his rational reconstruction of that reality.

How this may be, within his *De Corpore* Hobbes treated of the physiological and psychological basis of his ethics and politics. In the fourth part of the *De Corpore* he spoke of *Physics*, and the major part of it is devoted to his theory of sense, which is the basis of his rational reconstruction of human mind and the internal motion. Insofar this basis has to be reckoned with for a good comprehension of his treatment of human conduct and interpersonal relationships, an *a posteriori* element enters his ethics and politics. But one does not need to insist on this, for Hobbes chose for an *a priori* treatment (based on introspective insights) of sense and internal motion. This mode of exposition will be repeated in the further history of psychomechanics.

Hobbes questioned the meaning of sense. His inquiry begins with sense itself, for 'he that perceives that he had perceived, remembers'. So, memory, the existence of ideas or phantasms, was his starting point. Sense, and memory based on it, is internal motion. No motion is generated without the influence of a contiguous body in motion. From this, Hobbes concluded that sense means the touching and pressing of a sense organ. The part next to it is pressed as well, and so on. All this provokes a propagation of pressure, or motion, to the innermost parts of the organism (or body). But pressure means resistance, and resistance means reaction. Hobbes supposed an internal natural motion in the whole receiving organism. This internal natural motion is the origin of reaction against motion, which is propagated from the object to the innermost part of the organism. From that reaction, how little its duration may be, appears a phantasm or idea :

Sense is a phantasm, made by the reaction and endeavour outwards in the organ of sense, caused by an endeavour inwards from the object, remaining for some time more or less.

Sense is the link between the subject and the object : the organism and nature outside the organism. The link between these two is the sense-organ, which is capable of the propagation of motion and of

the generation of phantasms¹⁰. Total destruction of sense-organs equals total destruction of the capacity of phantasms, in spite of the fact that a whole complex of nerves, brains and heart, responsible for the propagation and the reaction towards the motion from the outside-world, remains untouched.

But though all sense, as I have said, be made by reaction, nevertheless it is not necessary that everything that reacteth should have sense. I know there have been philosophers, and those learned men, who have maintained that all bodies are endued with sense. Nor do I see how they can be refuted, if the nature of sense be placed in reaction only. And, though by the reaction of bodies inanimate a phantasm might be made, it would nevertheless cease, as soon as ever the object were removed.¹¹

Hobbes saved the continuum of matter (inanimate, animal and human), despite his conclusion that inanimate objects (stones, rocks) have no senses, no capacity to generate ideas or phantasms of even an infinitesimal duration. Stones have reactions, but they do not possess the capacity to remember (to distinguish, to judge, to compare, etc.) motions.

Hobbes observed that sense must imply the capacity of discrimination in a perpetual variety of phantasms¹². He clearly reckoned with bodies (or parts of bodies) which have no sense in the definition he gave of sense: namely, duration of phantasms, possibility of memory, comparison, selection, and so on. It are bodies of animate nature, which such as inanimate objects are similar in their non-reaction towards external motion. An imaginary experiment led Hobbes to this conclusion: someone, who has but the capacity of visual perception and moreover perception but of one thing, must be in the same condition as we are relation to the 'perception' of our internal organism (for example our bones). Although parts of our organism are touched on all sides by sensible membranes we have no power of discrimination relating to them whatsoever. Sense means selection, and can but consist of motion and reaction towards *one* object: sense-organs cannot be moved by a variety of objects, meanwhile generating clear and discernable phantasms at the same time. Sense equals restriction of motion- and reaction-series. 'For what is *stupor* but that which the Greeks call *ἀνοήθεια*, that is, a cessation from the sense of other things¹³..' Sense and knowledge means choice; so, in Hobbes's opinion scientific knowledge from the onset is burdened with the

problem of choice.

A phantasm remaining after the object's disappearance, is called a fancy (*imaginatio*); it is decaying sense, weakened sense, because of the absence of the object. Why the sense is weakened by the absence of the object? Because other objects are present and are provoking concurrence towards the phantasms of the objects already absent. In principle, phantasms of objects absent can be as clear as phantasms of objects present, but the latter are predominant, and in that way induce the weakening of the former¹⁴. This is also the reason why phantasms can be so clear in dreams; all passages being shut up, external action does not disturb or hinder internal motion.

Hobbes spoke also of the succession of phantasms. Phantasms or ideas proceed from one another, for they are similar, or for they are opposite. The motion of a continued body is motion of all parts, one part following the other :

...and therefore, whilst we turn our eyes and other organs successively to many objects, the motion which was made by every one of them remaining, the phantasms are renewed as often as any one of those motions comes to be predominant above the rest; and they become predominant in the same order in which at any time formerly they were generated by sense¹⁵.

Thomas Hobbes formulated a theory of dreams based on his theory of sense (motion and internal motion). A succession of phantasms, in an unorderly series, is a dream, for the dreaming person lacks the orientation of the succession of phantasms to an end. This brings us to the problem of *will* : orientation in the succession of phantasms. Hobbes spoke of it in his work *De Homine*¹⁶.

The theory of appetite and aversion, in which definitely the internal original motion of the organism is coming in, is the final part of Hobbes psychomechanic explanation of human nature. The problem is that Hobbes has to be consistent with what he said about the sense, and the orientation of phantasms. We referred already to the problem of selection, and reaction when discussing his theory of sense. But we know as well that all feeling and perceiving, is internal motion. The same is true for the feelings and perception of what concerns the body. Physiological movements are at the origin of feelings of appetite and aversion. The causes of appetite and aversion, as of the senses, are the same objects of the senses. The problem

however is the moulding together of the two : external with internal motion. I am not at all certain that Hobbes succeeded in providing to with a solution for the problem. Here, for the first time, Hobbes is stepping over a crucial point in his psychomechanics, in proclaiming (instead of proving) the similarity of sense and appetite/aversion, and in proclaiming the combination of the two.

However, the theory of appetite and aversion is comprehensible when considered on itself. We do not desire because we will. Will is nothing but appetite. And appetite is the thing called for and generated by *internal motion*, as consequence of *the motion of an object of the senses*¹⁷. It is impossible, Hobbes said, to be free in what one desires; desire is not voluntary :

When desiring, one can, in truth, be free *to act*; one cannot, however, be free *to desire*; a fact that is made so obvious to anyone by his own experience that I cannot but be amazed that there are so many people who do not understand how this can be¹⁸.

Deliberation is the process of free play of appetites and aversions in alternation, until a final appetite or aversion obliges to a decision. This final appetite leads to action (or to omission). The final appetite (aversion) is properly called the will.

Related to the problem we emphasized above, Hobbes considered sense prior to appetite. There exists no desire for the unknown, in spite the fact that we often have the desire *to experience* the unknown. So, what does not move the senses, cannot be object of desire. But why some things men experienced (things that moved the senses) are chosen to be desired, or are discerned to be subject of appetite, Hobbes did not make clear. *What is the final explanation of the orientation in the succession of the phantasms in monist-materialist terms, we asked above. If appetite and aversion mean moving towards or away from a thing, which can but occur when a thing is perceived, what is the ultimate internal origin of the motion towards or away from a thing ?*

The outcome of appetite and aversion is pleasure and pain, the mental appearances of the vital processes of appetite and aversion. Pleasure being linked with the appearance of the easy-going of the life-process; pain with the appearance of a difficult and cumbersome life-process. In this, Hobbes felt back upon Galileo's law of inertia :

it is the characteristic of a living being that it endeavours to continue to live. Left to itself a living being can but continue to live. This provides for the basis of his social mechanics, in which again the consistent construction of the propositions about the societal body, building on the 'causes' (his psychomechanic propositions) will be interrupted.

So, we are left with the problem of the distinction between the voluntary motion and the vital or desired motion and with the problem of the final explanations of the interaction between internal and external motion. We may conclude from it, that Hobbes's construction is not so complete as has been supposed in many commentaries. We are confronted with a programme of materialist and monist explanation that fails in some of its most crucial points for Hobbes abstracted from his original philosophical method in these passages. The same can be remarked, even with more emphasis, of his social philosophy. Hobbes explained his intentions and plans to construct a socio-mechanics, and in doing so he neglected to present one.

2.2. Sociomechanics

In his sociomechanics, or what stands for it, Thomas Hobbes felt back upon a mere introspective procedure and basis, leaving his deductive construction-plans totally out of view. The result is his plea for a 'Mortal God', which can but be understood in an historical interpretation¹⁹. The gap between the geometrical (deductive and semi-deductive) method in the *De Corpore*, and the more alusive method (neglecting the deductive and semi-deductive mode of reasoning) in the *De Homine*, can hardly be overlooked. The gap between 'the methods' of the *De Homine* and the *De Cive* (the latter parts of the *Leviathan*) cannot but strike the observator. Within the construction of the myth of a scientific philosophy, based on a unitary method, a new myth was created, namely the consistency and stringency of Hobbes's thought. That myth can be found in a lot of commentaries on Th. Hobbes's work.

Evidently Hobbes's problem was considerable. In his political thoughts he was hardly more stringent than Machiavelli was in his *Il Principe*. But such as Machiavelli, he provided for a future basis for social and political science, for he promoted the idea of a *machinery* of power in civil society. This idea was an intuitive idea, based on dispersed observations and on his consciousness of actual

problems of the nation-states in Europe. But Hobbes was well aware of the other problems of philosophy, namely the problems of Aristotelian teleologism in explanation of natural, social and political phenomena. He knew the Galilean revolution in physics and he played with the idea of a Galilean construction of social and political thinking. He was so impressed with mechanics that he substituted *mechanics* for *machinery*.

In order to stay within the boundaries of his program, Hobbes should have provided for a consistent construction of social motion, that ought to be based in some way, on individual motion, a fortiori on his psychomechanics. He was obliged to resolve the problem of reduction of social motion in a mechanical way, in order to look for the origin of social motion springing from the interaction of various individual motions. He did neither of the two, for he seemed not really interested in the programme he formulated at the onset. So we know, Hobbes left his reader with the problem of the internal motion, and with the mechanical combination of the external and the internal motion. His psychomechanics was very incomplete for a final explanation of voluntary and vital motion was wanting.

Hobbes's social and political philosophy contains quite definitely *the individual actor*. But this individual actor is an *abstractum*, not only within an *historical view* but also within a *systematical view* namely Hobbes's programme. The individual actor has neither the features of the Renaissance-citizen, Machiavelli's was speaking of in an explicit way, nor the features of a closed system, a machinery moved by specific internal and external motion.

Instead of this Hobbes exemplified two features, which are in a symbolic way highly characteristic for the time he was living in : pride and fear. It was the latter that yielded the foundations of a social equilibrium, by means of a political, explicit, and positive solution.

Paradoxically the answer to the question how Hobbes's social mechanism might have been if the author had endeavoured to complete it, has been given in later times by men under the influence of the main themes of Hobbes's scientific philosophy. But meanwhile the link (the logical and hence inferential link) between the psychomechanic part and the sociomechanic part of the program had been weakened. We will come up to this further in this

paper. In both the *De Cive* and the *Leviathan* the reader will seek in vain for some indicators of a sociomechanical construction. He will merely find the theory of the natural condition of mankind, of which is spoken elsewhere. Hobbes mentioned the starting-point of such a socio-mechanic construction. The historical period he was living in helped him to do this without any doubt. He introduced the terrifying picture of the individual actor in his splendid isolation. Only as a consequence of further transformation-processes, the capitalist mode of production and distribution was undergoing, could the conception of an individual actor, unbounded and unburdened by social ties, be developed and made fruitful for the various reconstructions of societal processes.

Hobbes never stated the kind of interrelationships between individual actors leading to conflict, gift, contract or covenant. Moreover he only spoke of contract, gift and covenant in a general way, without mentioning exchange. However, these four forms of interrelationship between individual actors would have provided him with the theoretical possibility to construct an hypothetical social system. Basically the different *processes of exchange* between individual actors, mechanically moved and directed by appetite and aversion, must end in what is called, in contemporary sociology, *structural differentiation of the social system*. Structural differentiation is the process which creates vertical and horizontal diversification among individuals and among groups of individuals. The process is responsible for task-diversification and hierarchical order, as the social system extends both in number and in space. This calls for *codification, evaluation, legitimation and justification*.

For a good comprehension, let us call *codification* the creation of rules of behaviour and of obligations, for some processes of exchange will end in gift, some in contract, some in covenant. Finally this will call for rules of obligations. Let us call *evaluation* the creation of the standards for approval or disapproval of the exchange-processes and the results reached at, a fortiori standards for approval or disapproval of task-diversification and hierarchical order. Let us call *legitimation* the endeavour to provide with proofs or evidence for the way task-diversification and the hierarchical order is arrived at and is established. To conclude with it, let us call *justification*, the endeavour to provide for the defense of the results of codification, evaluation and legitimation.

These processes of codification, evaluation, legitimation and

justification go along with the structural differentiation in the extending social system. To keep in tune with Hobbes's original endeavours and plans, the totality of these processes must be conceived of in a mechanical way. The outcome must be an equilibrium of forces, a mechanical result of the motions of individual actors. Moreover we have to conceive it of as deterministic, not stochastic, for the suppositions Hobbes started from, said that each individual is moved in a necessary way.

As has been said, one will seek in vain for such a tentative of a mechanistic reconstruction of social life in the two afore-mentioned works of Thomas Hobbes. It was unthinkable that Hobbes would come to these suggestive insights in the general characteristics of the ongoing social life, which are linked with the sociological work of Georg Simmel. But when we come to the conclusion that Hobbes's work shows an important gap, in relationship with the realisation of its explicit programme, we should not ignore the fact that especially this work contained the seeds of a social science to be developed in later periods. Moreover, Hobbes's insights in the social process and the phenomena of power and social equilibrium, enabled him to consider these phenomena and process as man-made.

How this may be, Hobbes derived the features of mechanics, to apply them to this intuitive construction of the state. The equilibrium reached at when the 'Mortal God' comes in existence, is deterministic and has realistic characteristics. This means that Hobbes considered the social equilibrium under sovereign and absolute power as a real phenomenon, caused by some social reality independent from his own construction. He borrowed from the developing physical science a model of scientific thinking. This model could only be formulated in a much clearer and more consistent way, as a consequence of the consecutive evolution of physics. Hobbes was an original thinker for he grasped very well the significance of modern science in an age of dying scholasticism. He must have been aware of the persuasive power of modern science, even if the application of the scientific shibboleth was not adapted to the tasks he figured out. Persuasive power to support his construction, was one of the things he asked for.

3. The mechanisation of the world-picture.

We only wish to comment on two characteristics of the pheno-

menon called the 'mechanization of the world-picture'²¹, relevant for the social sciences to be developed from Hobbes onwards : (a) the "downfall" of Aristotelian teleologism; (b) mechanicism as the scientific myth in social philosophy.

3.1. *The "downfall" of Aristotelian teleologism*

As one knows Aristotelian "picture" of the world relied on his natural philosophy in which entelechie and the theory of the four causes played a major rôle. But the all important thing of the Aristotelian programme²² is its naturalism drawn from Aristotle's investigations in biology. Aristotle said of these investigations :

Similarly we should approach the investigation of every kind of animal without being ashamed, since in each one of them there is something *natural* and something *beautiful*.

The *absence of chance* and the *serving of ends* are found in the works of nature especially. And *the end for the sake of which a thing has been constructed* or has come to be belongs to what is beautiful²³.

This is a remarkable passage for it exemplifies the Aristotelian approach in an early formulation. It shows the programmatic basis of his later philosophical development and of his investigations, which remained influential throughout the later Middle Ages and the Renaissance. The aim of the Aristotelian programme is to reveal the totality of reality, the final causes in the "works of nature". All that exists is not by chance, but is for some immanent purpose. One can demonstrate that this Aristotelian naturalism served as an important working-basis for investigations in natural philosophy and led to some accurate observations in biology. It functioned as such despite its philosophical content. In fact, one should consider it the other way round : for as far as its philosophical basis served as a programme for explanation, observation and classification, it showed to be effective and in that way reliable. We shall comment on this characteristic further on. It is linked with the general features of research programmes, which are tied up in broader philosophical conceptions, immune to rigorous scientific tests.

We ought to search for similar characteristics in the Hobbian philosophy, a fortiori in its mechanicism. The idea seems to be that neither Aristotelian naturalism, nor Hobbian mechanicism is in itself a valuable philosophical approach. It is only through the effects of

the implicit or explicit programmes that any discrimination becomes possible. It was only through the influence of Galileo's work that the Aristotelian naturalism was successfully overcome. One knows that Galileo was convinced that the book of nature was written in mathematical language. The universe is conceived of in a mathematical way. In his *Discorsi e dimostrazioni matematiche intorno a due nuove scienze* (1638), written after the inquisitional trial and in which Galileo took revenge, he attacked Aristotelian physics.

Galileo made criticism concerning the teleological picture of natural phenomena. He was in strong opposition to Aristotle's way he treated motions. For Aristotle all motion should be conceived of as finalistic. Objects move towards their natural places. Objects unbound move towards the earth, for they have natural places on it. Galileo was in discontent with this kind of explanation. He relied on another conception of explanation, in which mathematics played an important role. Nature, and a fortiori motion, correspond to mathematical laws. All the knowing subject — the scientific investigator — has to do is to read these laws in the universe and to write down their mathematical form. Those parts of reality have to be investigated in which the mathematical characteristics are most evident. Not biology, as was the case with Aristotle, but astronomy, statics and above all mechanics had to be investigated. And as Copernicus and Kepler intended to realize, the old dichotomy between *Physica coelestis* and *Physica terrestis*, the former of a mathematical form, the latter not mathematical, had to be exceeded.

This could be done in applying the experimental method which provided for a linkage between deductive and inductive procedures. In this way Galileo developed his conception concerning motion, rest and inertia, which are totally different from Aristotelian conceptions. In Galileo's view motion is a geometrical translation from one point to another, a conception which is absent in Aristotelian physics. During the motion a body remains the same; its quality does not change in motion, which means that Galileo treated the quality of the body as irrelevant for the knowledge of motion. Aristotle learned that bodies changed in quality during their motions and he took this as the evidence for the dissimilarity between celestial and terrestrial bodies. All bodies in motion are tied up in one big process of the world. It is a process of actualization, of realization, in which an immanent finality of motion is working, shaping matter through form. It is a process of realization, an entelechie. A body alters towards itself and towards itself and towards all sur-

rounding bodies. Instead of this theory of immanent motion, Galileo conceived of a body moved by another body. No entelechie, no final causes, but only efficient causes come into the picture. Galileo considered it as totally irrelevant to describe the motion of a body relying on its qualities. Motion could only be conceived of in taking the surrounding bodies into account, i.e. in considering the relative positions bodies take towards one another. Motion of a body is a state, as is rest. Both these states are contradictory and a force is necessary to pass from one state to the other. In the Galilean view the state of motion, of rest or of inertia presupposes three features of physical reality on which experiment is based : (a) the possibility to isolate bodies against their physical surroundings; (b) a homogeneous and infinite space; (c) a mathematical or quantitative treatment of the properties of bodies. This quantitative view conflicts with the Aristotelian qualitative view of nature. In Aristotelian conception a sharp demarcation-line is drawn between rest and motion. Motion refers to the process of realization of forms out of matter, or to the process of realization of potentialities. Aristotelian motion implies an organistic relationship between a body and the surrounding parts of nature. One knows how the theory of substance encumbers these conceptions. Aristotle was seeking for the particular and concrete forms of reality, but he nevertheless stressed the general characteristics of these forms of matter. But how one may define substance, the features of Aristotelian physical reality exclude an isolation of bodies, for all things are bound together in one big world-process. Moreover Aristotle's space is heterogenous and finite.

3.2. Mechanicism and the scientific myth in social philosophy

One cannot but emphasize the importance of the consequences of the downfall of Aristotelian teleologism for human knowledge in general and knowledge of man and society in particular. We said that the Galilean approach is based on a refusal of the qualitative picture of reality. A quantitative picture is preferred and the discrimination was made between primary and secondary properties of things. The primary properties (quantity, density, volume, etc.) refer to the objective features of physical reality. Teleological conceptions are useless for they oblige us to a qualitative view and hence a subjective approach of reality. One should recall that in this way a decisive step was taken in natural philosophy : the demarcation-line between reliable scientific interpretation and knowledge and unreliable — a fortiori — unscientific interpretation, was sharply drawn.

So the attractive idea of a reliable and scientific knowledge was born which was rather successful in physics and more particularly in mechanics as one knows. One had only to wait for the mythologization of the idea. Hobbes, among many others, was one of creators of the myth of scientific rigour and reliability of mechanism in other domains of reality.

The idea of reliable, scientific thinking was based on the sharp distinction between the knowing subject and the known object. It was through the influence of philosophers such as Hobbes that it became popular and was propagated and defended as an example for all other knowledge. Knowledge of man and society should be based on the same clearcut distinction between subject and object, whatever the predictable success of such an approach. Moreover reliable knowledge is "preservational" knowledge, based on experimental procedures. This means that physical (and consequently social) reality had to be split up in well limited parts. Measurement and the systematic application of instruments to research demand this preservational approach, which is specific for Galilean science. Reliable knowledge through experiment means more accurate, more cumulative and testable, as well as more limited, manipulated and actively organized knowledge. In this way objective knowledge was linked with the subjective, operative interference of the scientific researcher in reality, using instruments of experiment, constructing an artificial reality, and utilizing methods and tools of measurement.

One should avoid the misconception that all this was a matter of scientific development in physics or natural philosophy. I am not at all convinced that we can apply an historical-materialist approach to it in a rigorous way²⁴, but the knowledge of some political philosophy antecedent to Galileo and Hobbes proves that a preservational and distinction-making approach was becoming a successful approach to all kinds of reality.

I only wish to refer to Machiavelli's contribution to political philosophy, for I am convinced that it can learn us something about the particular direction Hobbes went. The reader of *Il Principe* knows how its author relied on a distinction-making approach to social and political problems of the Italian city-states. Machiavelli was either with himself or with all those who kept power. So, the all important problem was to conceive of the mechanics of power as preserved as possible. The awful vice called "Machiavellism" is nothing but "Galileanism" avant la lettre but applied to political

reality. In fact "Machiavellism" is much more openly "Galileanism" in the political domain than "Hobbianism"²⁵. I am convinced that *Il Principe* contains a preservational and mechanical conception on human nature and society. And in this its author was far more modern, or Galilean, than other writers were. Hobbes drew the line only a bit further in creating a political philosophy based on a full-scale scientific philosophical programme.

Let us give a somewhat closer look to the differences. Machiavelli endeavoured to demonstrate that when prince A was "moving" the way he did, prince B should be "moving" in such and such a specific way. Again, A could anticipate the consecutive "motions" of B, in this in turn could again be anticipated by B, and so on. Different action-patterns can be listed. This gives rise to a fatal social reality, which is never ending and which shows only temporary equilibria. There exists a mechanics of power, which given the initial conditions, can but be what it *is*. What one can do, as an acting and competing individual, is to gain knowledge of the regularities of the mechanics of power. One can add it as a positive factor to the initial conditions. This shows a tragic characteristic of Machiavelli's work: in studying the ongoing power-mechanics, which is never-ending and self-consuming, he revealed a power-reality that enables whatever prince or municipal authority to win the game temporarily; but while doing this he is pushing the limits of the fatal mechanisms of power a bit further out of the hands of the same princes and authorities. At the end Sforza can but be Sforza and Morus is certainly going to loose his head. But what is of interest for us here is that the mechanical conception was already successfully applied in political and social reality and was not at all a purely physical conception. Moreover Machiavelli suggested in his *Il Principe* a preservational and nearly quantitative treatment of power, without mentioning any teleological consideration. Power is fatal, as a consequence and as a mechanical process. There exists no "natural" limit to it, no "natural" restraint as Aristotelianism, and strange as this may sound, as also Hobbianism held. Nevertheless, in Machiavelli's conception, power corresponds to the principle of inertia: power which is not restrained by some counter-power, tends to grow ever stronger and stronger, but in a diminishing way. The prince whose aim it is to get more and more power, has to reckon with a diminishing — power — effect. However once started he cannot restrain himself from continuing to get power for to restrain power means to loose power.

It is a most interesting characteristic of Machiavelli's conceptions that any legitimation of power is absent. Legitimation equals finality and this urges for a natural result of mechanical processes. This cannot be. This characteristic stands in a striking contrast to Thomas Hobbes's political thoughts, in which an all-ending equilibrium is reached at. In Machiavelli's political philosophy one encounters the pure mechanics of power, taken out of social reality itself, and clarified in its main features, neither justified nor legitimated. Cesare Borgia is a "good" prince, which means he is temporarily an effective "mover", because he moves the way he does and shows to be successful in it. No final end can ever serve as a justification or legitimation-basis, for the power-mechanics has no "natural" end.

The characteristics, I mentioned above, shows us a Machiavelli who was not disguising the mechanics of power. I said that his pure mechanics was revealing social reality itself. Again this is in contradistinction with Thomas Hobbes, who presented a non-existent or imaginary social reality in order to infer a preferable political equilibrium, or to infer an eternal 'Mortal God'. I consider this characteristic of the *Il Principe* as an advantage over Hobbes's *Leviathan*. One is struck by the realistic account Machiavelli gave of power-struggles in Italy. But again and again it becomes clear that he conceived of this power-struggles from within a society destroyed by factionism. In fact Machiavelli was identifying himself with this factionism, despite his arguments for a strong Italian nation-state on some places. He saw only temporary and particular equilibria and never argued with a conception of an overall and general equilibrium of power before his eyes. This can easily be understood: Machiavelli was too much occupied by the real mechanisms of power and a pure factual mechanics of power, to construct an all covering and systemizing view on power. This was done by Hobbes at the expense of factual content, but with the result of a "scientific" philosophy in which mechanics *was proclaimed* as the central explanatory idea without functioning as an effective and actual explanatory device. What was gained in systematization was lost in factuality. What in Machiavelli's work was an unexpressed but factual pure mechanics of power, was transformed in an expressively leading principle of legitimation in Hobbes's political philosophy. In Hobbes's work the scientific myth of mechanics was substituted to the factual demonstration of power-mechanics.

The author of the *Il Principe* shows us the real and factual me-

chanisms of fear, war and discontent in the terminology of social classes and power-factions. In vain one would seek for the 'mythical' approach of fear, war and discontent, that is so highly characteristic for the *De Cive* and the *Leviathan*. Machiavelli left power, not of the state but of the prince, in a permanent state of war and insecurity. He translated his own political and social experiences and expressed the features of his time. As we said above "Machiavellism" in Machiavelli's *Il Principe* is the acceptance of this permanent state of war and insecurity as a fatal consequence of power-mechanisms. But this was the thing Hobbes detested most of all. And because of his abhorrence of war and insecurity, he invented the systemized scientific myth of the mechanics of man and society. So he, and not Machiavelli, was the father of the ideological direction social philosophy had to go.

4. *Some preliminaries in the history of the idea of mechanics in social sciences and ethics.*

One should concentrate further research in the history of social sciences on the idea of mechanics. In fact, Hobbes's programme has had many followers even up to our time. Even if it is impossible to review them all at this moment, I shall mention some of them, leaving it to further research to reveal the content and the features of the other examples in social philosophy, sociology, economics, and political science.

4.1. *Main examples of the mechanistic conception in social sciences*

I said already that it cannot be my aim to be complete on this subject matter. A full-scale reconstruction of the history of this idea can but be the result of a long term project, as one easily can imagine. I shall draw the attention to the examples of De Maupertuis, Jeremy Bentham, H.H. Gossen, L. Walras, A. Quetelet, G.T. Fechner.

The influence of British philosophy on continental thinkers was very great in the eighteenth century. French philosophers were developing the conception of pleasure, in order to construct a scientific picture of human action. De Maupertuis, who was well acquainted with the history of mechanics and was an original publicist on the matter, took the idea of pleasure as the prime mover of man, as his working-basis in the *Essai de Philosophie Morale* (1756). In this essay De Maupertuis formulated as has been done before the idea of the calculus of pleasure and pain. He did not discuss ethical

problems, as the title of his little essay should suggest. On the contrary he was treating of an action-theory of man in which the mechanics of pleasure and pain, mentioned in the political philosophy of Hobbes and Locke was further developed. In this way he anticipated the work of Jeremy Bentham. Already Daniel Bernoulli had endeavoured to develop a similar theory, although on a narrower basis than De Maupertuis has done. Bernoulli treated of the calculus of utilities in his *Specimen Theoriae Novae de Mensura Sortis* (1738), which was an essay for mathematicians. He limited himself to the treatment of choice-behaviour in situations of risk. De Maupertuis wrote for philosophers and moralists and treated of human action in general. He limited this human action to the problems of the human evaluation of external situations and phenomena. The Hobbian psychomechanics worked has the implicit basis. Through our sense-organs we have experienced of the external world. This yields us our pleasure- and pain-sensations.

The originality of De Maupertuis was that he suggested a general outline of the utilitarian calculus, which later on was to become the general content of Bentham's programme of a scientific ethics and jurisdiction, which has to be considered as a mechanics of man and society as well. De Maupertuis suggested to estimate happiness and unhappiness in man relying on duration and intensity of the sensations which provoke pleasure or pain. The general problem in the theory of action consists in giving a reasonable account for the choice man is making in the variety of sensations of pleasure and pain. Only concentrating on duration and intensity will provide for criteria which can be treated mathematically. And only in this way an exact measurement of the elements of human action could be advanced.

Bentham endeavoured to develop these ideas further on and intended to formulate a full-scale scientific picture of man and society in purely mechanistic terms. The calculus of pain and pleasure was the ultimate basis of human decisions and action. A better understanding of this calculus will lead to a better comprehension of human decision and action, and may serve as the foundations for a scientific approach of societal problems, first of all juridical and administrative problems.

Hobbes's deterministic approach of human action and of society was never out of view. In fact Bentham was one of Hobbes's most exemplary pupils. Again and again man and society were con-

sidered as *clocks* : complex realities which behave as clocks do, with an inner mechanism only to be detected or reconstructed in order to grasp the mechanistic nature of the psyche and the social behaviour. Never after Hobbes and before Bentham the nominalistic programme of the former was formulated in such a radical and straight-forward manner. All reality was conceived of as one great mechanism, to be decomposed in smaller mechanism. Bentham expressed these views relating to his gigantic project called *Chrestomathics* (*Chrestmathia*, 1816 to be exact). He proposed an encyclopedic tabel in which all sciences were united on the basis of a psycho-physics. The common ground to this was his own *Eudaemonics*, the science of well-being in which the calculus of of pleasure and pain and the principle of the greatest hapiness of the greatest number were central.

As his great teacher and predecessor, Bentham never succeeded in formulating an effective model of socio-mechanics. He left us with some programmatic thoughts on the subject-matter. How this may be, within the context of Bentham's panoptic vision on man and society, the calculus of pain and pleasure was developed up to the point where the subjective theory of value, also called marginalism, was appearing in the first time. Bentham was very enthusiastic about his moral arithmetics, which contained the rudimentss of the marginal approach to value and valuation. In his *Pannomial Fragments* he suggested a psycho-mechanical approach that might cover the whole range of human activities and in anticipation to Gossen, Javons and Walras he formulated the law of the diminishing utility.

One of the really innovating things in the rather unknown work of Hermann Heinrich Gossen was the consequent endeavour to succeed where others, such as Bentham, had failed. Continuing the idea of the calculus of pleasure and pain and the moral arithmetics, Gossen formulated in his only work of 1854 some very general outlines of a mathematical-mechanical treatment of human relationships. In the first part of his obscure work²⁶ Gossen proposed a theory of human action in the context of which a mechanical model of human relationships could be constructed. With a remarkable tenacity he worked out the implicit and explicit programmes of 18th and 19th social philosophy. He introduced in his theory of action and human relations the differential- and integral calculus. For he believed that human beings are amenable to mathematical law²⁷. Again Gossen endeavoured to construct his theory in a geometrical way : a formalized exposition linked with an axiomatical construction. In this he went farther than anyone before him, although he

hardly added something in theoretical content. In a very explicit but rather intricate way he formulated the marginalist laws of utility which through the work of Jevons and Walras developed in a new theory of value. His *Entwicklung...* contains the result of an ineffectual attempt to reach at some knowledge concerning man and society in a mathematical way. The Gossian tenacity revealed the final limits and the ineffectiveness of the Hobbian scientific 'myth'.

It was up to L. Walras to develop this Gossian attempt a bit further (although both authors did not know about each other in exposing their theories). He did this in his *Eléments d'Economie Politique Pure ou Théorie de la Richesse Sociale* (1874). The conceptions Gossen had about exchange — his model and nucleus of the system of human relationships — were rather limited. The modes of exchange Gossen mentioned remained extremely simple and could not provide for a more extended approach of social exchange. Gossen worked only with the exchange between two actors and he believed in interpersonal comparisons of utility. He looked forward to the exact measurement of utility of which J. Bentham was already speculating. But a socio-mechanics cannot be very effectual (if effectual it ever can be) under these circumstances. Social "motion" (Verkehr, relationships) is much more complex. More than two actors are involved. So the problem was to develop in the same formalized and axiomatic way a construction of exchange in which more than two actors are involved. L. Walras, among others, developed such a theory of exchange and he formulated a theory of equilibrium, focusing on the economic activities of man. The general characteristics of the Hobbian programme were conserved. Again, Walras formulated an ideal theory of human relationship, viewed as economic relationship, with 'mythical' features reminiscent of Hobbes's political equilibrium. But there was some progress. Not contract, but exchange became the central point, and the effective mathematical treatment, instead of the former geometrical treatment, reached a degree of sophistication Hobbes could not have dreamed of. Afterwards, it was only V. Pareto and still much later J. Von Neumann and O. Morgenstern, who extended and recomposed the mathematical treatment of human relationships. However, contract, exchange and conflict continued to be investigated on a high theoretical level from the point of view of the objects of contract, exchange and conflict, and in a secondary way from the point of view of the relationships between subjects.

Again and again confidence in the programme of a socio-me-

chanics was expressed by those who worked on the subject-matter. Gossen believed that he further elaborated the work inherited from Copernicus and Kepler and piously looked forward to the Messianic arrival of a new Newtonian synthesis. Not always those beliefs were exposed in a similar way. But even within other approaches, such as the one of A. Quetelet, the same expectations reappeared. Quetelet, an adept of Comtist positivism, developed a similar idea of socio-mechanics in his famous works *Sur l'homme et le développement de ses facultés, ou Essai de Physique Sociale* (Paris, 1835) et *Du Système Sociale et des Lois qui le régissent* (Paris, 1848), in a different methodological way. In De Maupertuis, Bentham, Gossen and Walras in one way or another variations on the theme "the principle of the least action" can be read, and the infinitesimal approach was the leading idea²⁸. In this way a particular idea about the theoretical treatment of infinitesimal phenomena became popular. The remarkable progression in the theoretical language of physics, as a consequence of the Newtonian and Leibnizian infinitesimal calculus, obliged to the application of it in other domains of reality, without asking questions concerning the existing and limiting correlations between these specific reality-domains and the particular theoretical language²⁹.

We saw how this is in correspondance with the 'myth' of the scientific treatment of man and society which Thomas Hobbes introduced a long time before. Quetelet proposed that social research should be directed towards empirical tasks. To seek for the causal determinants of the characteristics of man and to look after the averages of these empirical data, that was what he suggested. This is a somewhat different approach compared with the strictly deductive approaches of Gossen and Walras. But nevertheless Quetelet was expressing the old credo : man is moved by the all embracing principle of motion, and in this way 'the great architect of the universe' has provided for the laws of equilibrium. Once again Newton should be mentioned as the great example :

C'est par des lois semblables que sa divine sagesse a tout équilibré aussi dans le monde moral et intellectuel; mais quelle main soulèvera le voile épais jeté sur les mystères de notre système social et sur les principes éternels qui en régissent les destinées et en assurant la conservation ? Quel sera l'autre Newton qui exposera les lois de cette autre mécanique céleste ?³⁰.

G. T. Fechner conceived of one of the most daring expressions of the mechanical programme. He was sticking to the first part of Hobbes's philosophy of man and society in his exposition of an experimentally orientated psychomechanics, which found a lot of enthusiastic followers in the late nineteenth century. Fechner advanced an independent and exact science of the functional relationships between body and mind. The minimum-content of his specific program consisted of investigations concerning the phenomenon of sensation, especially the intensity of sensation. The maximum-content however was much more ample, for it contained also the speculations about external forces of man, namely the "Aussere Psychophysik".

4.2. Methodological issues relating to the idea of mechanics : fertility and infertility of an idea; analytic and synthetic power of an idea.

Several times I mentioned the functioning of what I called a 'programme'. It is necessary to comment on this point. In reviewing some examples of mechanics in social science I raised the problem of the effectiveness of the idea of mechanics applied to questions of sociological research. In an implicit way I suggested some points of relevance to the problem of criteria of evaluation in the philosophy of science. Can we evoke the fertility and infertility of an idea of science, and can we speak of the analytic or synthetic power of an idea. If so, whatever the idea and its metaphysical status, can we develop the necessary criteria for the evaluation of such ideas, in order to choose our way out. The latter question is of much importance to us, for we mentioned the danger of the mythical content of an idea of social philosophy and social science. So the problem is to decide between ideas meanwhile attempting to avoid in the long run the mythical burdening of them.

I believe that the idea of 'programmes' (implicit or explicit) in social philosophy (first) and in social sciences (later on) is a useful idea for the analysis and appreciation of the history of philosophy and science. The conception of a programme was proposed by Imre Lakatos in his *The Methodology of Scientific Research Programmes* (1978). He attempted to avoid the pitfalls both of 'instant rationality' and Kuhnian irrationalism. Lakatos did so within the context of the debates in the philosophy of science concerning the demarcation between science and pseudoscience, demarcation for which he thought 'instant rationality' totally ineffectual. Never-

theless he kept seeking for other criteria of demarcation. Lakatos was opposed to the idea that we could have an immediate possibility of decision between scientific or unscientific theories or approaches of reality. I think we can use Lakatos's insights in the problems of philosophy of science, in extending them a bit further. In social philosophy and the social sciences which proceed from it, we lack an immediate possibility of decision about the scientific or unscientific aspects of a programme of research. The examples of Hobbes, Bentham and later on Marx learn us that the implicit and explicit programmes correlated with their names cannot be considered as defeated, as has been done most of the time, in applying to them the rather foolish criteria of the late logical empiricism. Naturally, too much energy has been spoiled on this issue, for too many investigators considered the criteria of logical empiricism of social philosophy as very respectful. The consecutive development of the philosophy of science liberated us from earlier fanaticism. Logical empiricism wasn't so respectful at all when the demarcation-problem was at stake. And although Popper was one of the first to have a penetrating criticism on the subject, he himself committed the error to look after an 'immediate' demarcation. Most of the time one attempted to demonstrate the 'foolishness' of Marxian research in this malevolent way. Even Popper was not convincing in doing this.

In Lakatos's view on science, instant rationality and the quick kill so characteristic for logical empiricist and Popperian (or early Popperian) demarcation precepts, were exterminated. The influence of Kuhnian approach is evident. Lakatos argued that the history of science is the history of scientific research programmes. research programmes have a capacity to outlive falsifications. They can stand the crucial experiments for a long time which intend to prove them to be wrong in contradistinction to other programmes. At the end the 'progressive' scientific research programmes do oppose and are substituted to the 'regressive or dying scientific research programmes. So, rationality is saved by Lakatos but declared a question of long term evaluation.

I wish to draw the attention to the explicit problems of Lakatos's view on scientific progress and evaluation of ideas of 'scientific' approach. The first question is : what is a scientific research programme ? Does it refer to an explicit programme of research in which its creator is the focusing point ? Or does it refer to an implicit programme to be revealed by the students of scientific ideas ? Is 'explicitness' a necessary condition to apply the qualifica-

tion of scientific research programme to ideas? The second question refers to the important feature, called 'progressivity' of the programme. Do we dispose of efficacious criteria to measure or to decide the 'progressivity' of a programme? This refers further to a third question: is there any demarcation possibility saved within the Lakatosian view? And in this subject matter the problem remains the same: does Lakatos provide us with a normative or a descriptive treatment. I shall not comment these questions in this paper, for it would draw us too far away from our theme of the functioning of the specific idea of science in social philosophy and social science I mentioned before. However I cannot do without giving some brief answers so that my position becomes clear.

In reviewing the preliminaries of the history of the idea of mechanics, starting with Thomas Hobbes, and in outlining the birth of a specific myth of scientific treatment of man and society, I assumed that an implicit programme of research was at work. It is a 'developing' programme, of which the general outlines, I should say the central beliefs, have been formulated from the late Renaissance onwards, and have been expressed in a very unequivocal and exemplified way by Thomas Hobbes. I believe that the programme, whatever its implicit nature and its mythical features may be, possessed outspoken progressive characteristics and possibilities. I believe that this is true in a factual and descriptive way³¹.

So once again implicit nature, progressivity, mythical features, things I mentioned above, are linked with the descriptive or the normative aspects of the demarcation-debate. One of them is the fact that in relying on the programme one could for the first time in the history of social philosophy allow for a distanced approach of man and society, while focusing on the substantial particularities of these subject-matters. Their autonomy was established. This was necessary for a clearer comprehension of human and societal phenomena. In another paper we sketched how the changing social, economic and political conditions in the late Renaissance were in part responsible for it. How it may be, all this confronts us with the theme of the 'progressivity' and 'demarcation', or to put it in another way, with the theme of the 'mythical' character of the idea of mechanics, and the relationships between this 'scientific myth', as I kept calling it provokingly, and the ideological content, which I stated rather unclearly until now. Can one call the idea of mechanics the nucleus of an implicit evolving programme of scientific comprehension of man and society, while stating at the same time its 'mythical' cha-

racter? I think we can. Does it follow that we loose forever the possibility to distinguish between 'scientific' and 'unscientific' thinking and does it mean that 'rationality' is in danger? I consider this a deceiving question, which leaves us under the spell of the old rationality-magic.

Let us try to explain our position once again relying on Lakatos's views. Lakatos called syntactic-metaphysical theories 'scientific' on condition that they imply positive heuristic instruments, which enable to a progressive problem-shift in the auxiliary hypotheses of the theories. In this way, the metaphysical theory can be considered as the 'hard core' and the auxiliary hypotheses as the 'protective belt' of a scientific programme. The 'protective belt' provides for the mobilization of 'facts' and it is the basis for corroboration. As far as this is done by means of positive heuristic instruments, included in the metaphysical theory, one can speak of 'scientific fertility'. Lakatos is quoting Cartesian and Newtonian metaphysics. The final decision on behalf of Newtonian metaphysics was a consequence of its progressive character. The central point was not the demonstration of a 'scientific truth', but rather to show the capacity to explain 'facts'³², and to anticipate factual data in the auxiliary hypotheses.

We retain a synthetically metaphysical theory as long as the problematic instances can be explained by content-increasing changes in the auxiliary hypotheses appended to it ²⁸.

Only when problematic 'facts' can but be explained by altering the auxiliary hypotheses, which does not result in an excess of the corroborated content of the theory, one must consider the theory as degenerating. Such a theory, as the nucleus of a programme, is eliminated if it produces a degenerating shift in the long run.

The methodology of a research programme with a 'metaphysical' core does not differ from a methodology of one with a 'refutable' core except perhaps for the logical level of the inconsistencies which are the driving force of the programme³⁴.

Lakatos suggested to distinguish between 'observational statements' and 'theoretical statements' in discussing the fertility of a programme. In this the background of the programme is of relevance, for it points at the 'interpretative theory' by means of which the distinction is made between 'observational' and 'theoretical statements'.

Lakatos argued that the 'dynamic', the progression of theories is a question of the relationships between the three elements which can be found in scientific programmes: 'observational statements', 'theoretical statements' (hypotheses), and 'interpretative theory'. Progression is not only a question of the relationship between the first two. The 'interpretative theory' renders us the elements which are to be considered as the 'observational data'. The 'theoretical statements' (the explicative theory of the programme) say us what can be considered as explanation, relating to these 'observational data'. Between the two, the 'interpretative' and the 'explicative theory', a contradiction can grow. Consequently, the problem is to get rid of the contradiction. It can be done at the price of degeneration, or of excess corroborated extent of the theory.

In this way Lakatos was convinced that the typical descriptive element of scientific progress was not a single and isolated hypothesis. It is a rather obscure or else an explicit research programme which cannot easily be limited. He pointed to both a metaphysical and a 'factual' content, which are related one with the other. The decision concerning theories, and a fortiori scientific programmes, is a question of the evolving appraisal and evaluation of the inter-related metaphysical and 'factual' content.

I can conclude that a theory can be mythical and can possess an explicative character leading to the mobilization of 'facts'. As Popper already made clear some decennia ago, there is no way to heaven which means towards an indisputable scientific truth standing in unequivocal contradistinction to foolish fantasy. Lakatos added that an efficacious metaphysical 'hard core' linked with a developed 'protective belt' make the demarcation-problem a problem of long run decision. Consequently, the history of ideas shows the coexistence of scientific programmes.

This Lakatosian view can provide us with an answer relating to the problem of the progressive characteristics of Hobbian mechanical thoughts. Hobbes's ideas remained programmatic and could only be elaborated in and through the consecutive history of social philosophy and social sciences. We should restate and reconstruct the great moments and epochs of this history, in order to demonstrate still further the ambivalent character of the idea of mechanics. Only in this way we can succeed in showing the progressive and degenerating dimensions of it. This should be done in executing a full scale history of the idea. Perhaps we shall be induced to con-

clude as follows : only after some time the 'mythical' character of the idea (or more generally speaking, the myth of some specific 'scientific' approach) became both troublesome and clumsy. This happened after the idea provided for the foundations of a better understanding of a fast developing society. In fact, it is this thesis that we should attempt to corroborate in making use of what we called 'a full scale history of the idea'.

Above we commented on the aspects of 'fertility' and 'infertility' of the idea. The problem of the analytic and synthetic power of the idea isolated to this. Let us consider our overview of the methodological issues at stake, with some brief comments on this latter aspect.

An idea such as the idea of mechanics can possess heuristic power. This does not refer to the direct corroboration of its content. Its power is rather linked with the more or less great capacity to induce the analysis of 'facts' and to result in a theoretical synthesis with a more or less empirical content. Evidently, we should be careful in not exaggerating the role and the significance of analysis and synthesis in the existing social theories. We should avoid hasty conclusions and too great an enthusiasm towards the impressive symbolic constructions with which the social sciences are encumbered in the twentieth century. These symbolic constructions, and some are still linked with the idea of mechanics, have gained a relative autonomy, but they still lack any explicative features. They should be considered as reconstructions of reality by means of a sophisticated symbolic language, which functions as a magic shibboleth. However this may be, in the contemporary crisis of social sciences, we should nevertheless emphasize the urgent need of the analytic and synthetic capacities of an idea, instead of its symbolic features. Once again this will oblige us to a better understanding and knowledge of the history of the idea (for example, the idea of mechanics) linked with the history of its heuristic performances.

An idea, or a programme, functions as an 'insight-bringing' vehicle. It is not a theory itself but it contains the means to formulate one. Through its clarifying insights, and whatever its 'mythical' character it helps us to see some 'facts', to rely on them for the analysis of complex circumstances in decomposing them into 'facts', and to look after a theoretical synthesis.

It can easily be shown that Thomas Hobbes's programme of

mechanics applied to man and society possesses in part the properties just mentioned. Whatever the future degenerating role of the contract- and political equilibrium-content of his programme, he was able to reveal some significant 'facts' about a new-born society and its political institutions. Moreover he provided with one of the most powerful and influential legitimations of the modern nation-state. Evidently, legitimation cannot be considered as a criterion for the explicative character of a programme, but in the case of Hobbes it succeeded in drawing the attention to modern institutions that had to be investigated again and again. So his programme provided us with the 'fact' of the modern nation-state in an unambiguous way. Finally he proposed to ask the interpretative questions concerning the original state of society and the human relationships which are basic to modern institutions. He came to this through his admiration of Galilean mechanics. Neither his contract-fear theory, nor his abortive social mechanics had any explicative aspects, but they carried the insights in a modern individualistic society and in the need of an organized formal central authority. In doing all this Hobbian thoughts suggested that at least the greater part of 'social facts', such as institutions, power-mechanisms, and so on, are autonomous results of automatic processes. This was the real basis for the future social sciences. 'Social facts', resembling Durkheim's 'faits sociaux', are the result of human actions (conceived of as motions) without any intentional and teleological character. Most of the time they cannot be conceived of in a finalistic way, for they proceeded automatically from the various and interrelated human actions. In my other paper in this issue, I attempted to show in what extent Hobbes's political and social philosophy had a synthetic character. It provided with a global view of societal processes. This acknowledgment of the global and interrelated features of society's processes rendered another basis for an independent social-scientific approach. Nevertheless, I pointed at the ideological mystifications, which were linked with it and which can explain why the mechanical conception of man and society could evolve into a degenerating idea of these two subject-matters. As in other domains of social reality and human knowledge, what is an advantage at one time, contains the fundamentals of inhibitions at another time and of the future disadvantages. This two-sided aspect is the characteristic of Hobbes's work. It is the basis for both his modernity and conservatism.

NOTES

¹I am referring to E. J. Dijksterhuis's magnificent work in the history of science, *De mechanisering van het wereldbeeld*, 1977 (1950) that I will be using in the next pages.

²*Leviathan*, Introduction, Italics by the author).

³I refer to Immanuel Kant's *Kritik der reinen Vernunft* in which the criticism is made on *total* metaphysic systems, i.e. systems about the totality of things. As one knows Kant considered the questions about the totality of things unanswerable.

⁴See my paper on *Collective Action : Theory and Praxis*, in *Philosophica*, 21, 1978).

⁵In answering the questions in the negative I am differing with Macpherson's somewhat abstruse endeavours to make Hobbes's political philosophy 'logically' consistent; I am supporting the Straussian hypothesis about the development of Hobbian philosophy. For the discussion of the debate concerning the consistency in Hobbes's work, based on Strauss's *The Political Philosophy of Hobbes* (1936), see the final section of my paper on the political philosophy of Hobbes in this issue.

⁶*Leviathan*, Part I, 5.

⁷See, English translation of *De Homine*, Man and Citizen, 1972, 1978.

⁸*De Homine* (engl. translation Man and Citizen), Chap. X.

⁹*De Corpore* (Engl. transl.), Part IV.

¹⁰One can see how this leads to a first problem in Hobbes's psychomechanics. Are the organs of sense qua organs of sense responsible for the generation of the phantasms? Or is the original internal natural motion of the organism responsible for the phantasms?.

¹¹*ibidem*.

¹²Again one should ask : is the original internal natural motion of the organism responsible for the selection, and if so on what basis?

¹³This means that all experience, and all knowledge, is burdened. Hobbes seemed to have held this opinion. Talking of the differences between animal and human life, he observed already that the feature of human nature, namely language — that means his starting point in philosophy! — provided men with their expressive and communicative possibilities, without making them better off. Language can be used to cheat, to lie, to exaggerate, to be a scholastic. A beast

cannot deceive itself. The same is true for knowledge. For 'study is nothing else but a possession of the mind — a vehement motion made by some one object in the organs of sense, which are stupid to all other motions as long as this lasteth; according to what was said by Terence, "Populus studio stupidus in funambulo animum occuparat".' One should be prudent towards this possession, for else study and knowledge might very well equal without any further possible correction stupidity, especially where extra-scientific motives are at work.

¹⁴I shall refer to this theory of sense, when treating the so-called law of diminishing utility and the law of proportional marginal utilities in Bentham's 'chrestomathics' and in Gossen's socio-mechanics.

¹⁵Ibidem.

¹⁶Chap. XI, concerning appetite and aversion...

¹⁷It seems to me that Hobbes leaves us with the demand for an ultimate explanation of the origin and orientation of internal motion in monist-materialist terms.

¹⁸De Homine (english transl. Man and Citizen), chap. XI.

¹⁹See for this my paper *Th. Hobbes in a world-system view*, in this issue.

²⁰See my points of disagreement with C.B. Macpherson in this paper and in the afore-mentioned paper in this issue.

²¹Cf. Dijksterhuis's work quoted earlier in this paper.

²²Besides relying on Lakatos I am basing myself on Werner Jaeger's classical work on the development of Aristotelian philosophy (one can call it Jaeger's thesis), *Aristoteles, Grundlegung einer Geschichte seiner Entwicklung*, Berlin, 1923.

²³First book of the "*De Partibus Animalium*", quoted by G.E.R. Lloyd, *Aristotle*, 1968, pp. 69—70; my italics.

²⁴See my criticism on Macpherson's over-accentuations.

²⁵I am grateful towards Benoît Angelet for some of the opinions expressed here, for we talked about the difference between Hobbes and other political philosophers, among whom Machiavelli. Both we interpreted Machiavelli as the revealing political philosopher and both we considered Hobbes as the disguising one.

²⁶*Entwicklung der Gesetze des menschlichen Verkehrs und der daraus fliessenden Regeln für menschliches Handeln*, 1854.

²⁷ See K. Arrow, *Mathematical Models in the Social Sciences*, in : M. Brodbeck (ed.) *Readings in the Philosophy of the Social Sciences*, 1968, pp. 635–669.

²⁸ See for example De Maupertuis, *Oeuvres*, 1756, Tôme II, *Lettres : Sur le Principe de la moindre quantité d'action*; and tôme IV, *Accord de différentes Loix de la Nature; Recherche des Loix du Mouvement*; Tôme I, *Essai de Cosmologie* : “Parlons maintenant du principe que j’ai regardé comme un des arguments des plus forts que l’Univers nous offre pour nous faire reconnoître la sagesse et la puissance de son souverain auteur. C’est un principe métaphysique sur lequel toutes les loix du mouvement sont fondées. C’est que, lorsqu’il arrive quelque changement dans la Nature, quantité d’action employée pour ce changement est toujours la plus petite qu’il soit possible...” p. XII.

²⁹ I very grateful towards Leo Apostel who lectured on this point both in public and in private, for example when I discussed some problems of the methodology of social sciences with him during my doctoral preparation.

³⁰ Quetelet, *Du Système Sociale*, Livre III *De L’Humanité*, chap. VIII.

³¹ Without entering into Laudan’s criticism on Lakatos’s views, I wish to draw the attention to a position of Laudan that I ought to consider in relationship with my intention, to undertake an ample history of the idea of mechanics in social philosophy. It is expressed in his book *Progress and its Problems. Towards a Theory of Scientific Growth*, 1977, to which Dirk Batens drew my attention a year ago, for which I am very grateful to him. Laudan said on page 170, exactly before he considered the “*History of ideas*” : “I want to dissociate my own model of scientific rationality as vigorously as possible from those of Lakatos and the other rational reconstructionists. Like them, I believe that the appraisal of the rationality of historical episodes is an essential task for the historian of scientific ideas. But there the similarity ends. Unlike the rational reconstructionists, I insist that it must be actual episodes, not some figment of our imagination, whose rationality we assess. Unlike them, I argue that the actual beliefs of historical agents, and the canons of rational belief of their epoch, must be scrupulously attended to. In contrast to the reconstructionists, I object to the invention of historical figures and the fabrication of historical beliefs in order to score philosophical points or to teach philosophical lessons. If the *philosopher* would learn something from history, he must make himself

a servant to it — at least to the extent of dealing with actual cases and actual beliefs. And if the *historian* is to find any philosophical model relevant for his own work, that model must allow for the evolving character of rationality itself.” (author’s italics).

³² ‘Facts’ are considered instead of facts. This means that factual data cannot be conceived of outside some theoretical conception of the world.

³³ Lakatos, o.c., p. 41.

³⁴ Lakatos, o.c., p. 42.

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