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THE MECHANICS AND THERMODYNAMICS OF MASS SOCIETIES

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“I cherished ideals, ideal states, without thinking about respecting the mass, whose state is the fatalistic consequence of causes independent from and unknown for itself.” Heraclites (the paraphrase of a fragment)

“Mathematics is the art of naming different things in the same way. If we choose the adequate expressions, we will be astonished to see that every demonstration referring to a given object can be instantly applied for many other objects; nothing, not even the words have to be changed, as the denominations become identical.” H. Poincaré: *Science et method*. Paris, 1908. p375

INTRODUCTION

I have only a small chance that after reading the title there will be anyone reading on these lines as well: my study does not say anything new to mathematicians, physicists, and chemists; and sociologists automatically categorise everything that is not a direct qualitative statement regarding society as methodology, which is seen, admitted or not, merely as the necessary evil. Fruits need to be washed before eating, but the washing itself does not belong to the process of eating. There are only a few economists and sociologists who express real demand for the exact handling of the empirical social science data; a process that has begun in the fields of physics and chemistry with their own data centuries ago.

Sociology is still **using mathematics** in the process of knowledge construction only **for the preparations or for the production of the half-finished idea** at best: the role of mathematics in sociology is still not the creation of models, as opposed to physics, where this started the scientific break-through in the work of Galileo.

However, it may lead to an even colder welcome that in my work I drew on the results of chemistry, geometry, mechanics, and thermodynamics. “What have these got to do with it?” may be the question of those who look at society as a construction absolutely foreign to nature. I am not going to begin a lengthy – and probably endless – philosophical discussion here: if my method is effective, then someone may still listen to the philosophy; but if it does not lead to any result, then no one will be interested in the precursory speculations. Only for the sake of raising curiosity, in the following I delineate three axioms justifying my method.

1/ **There are certain laws penetrating the whole of nature and society**, because if they did not exist, the interface between nature and society would be heavy with a pressure that would destroy society; moreover, it would have prevented even the evolvement of society.

In order to point out that it is so, it is enough to remember that the biological hardware of humanity carries the software generating society: language, communication, and thinking. The hardware and software would not be able to operate, if they were constructed based on contradictory principles. And then, we have not mentioned the demands that originate from the biological needs of human beings, which reach deeply into the volume of society: food production, physical security, conditions of reproduction, education, etc.

2/ If it is recognised that there are social laws, it needs to be acknowledged that **human beings have no freedom of decision as such**: neither consciously nor unconsciously can they disregard the law. Namely, if it were possible to violate the law, then de facto the law would not exist. However, if people follow the law because they cannot act against it, it is only a philosophical joke that there is such a thing as free will. Every form of normal and deviant behaviour and all of their culture-specific variations are law-governed.

These two presuppositions are the bases of scholarship: without them social science is either art or journalism. Yet is not enough to accept these theses only on the philosophical level: to show devotion at church and sin at home. The conclusion must be drawn: **if there are laws (not measures or conventionality!), then people are objects, and their acts are behaviour of objects**. If it is so, there must be laws that are common laws for every object; otherwise, they could not be put into the same category.

3/ If there are common laws for nature and society, it also means that **there are not only formal analogies** between certain phenomena of nature and society **but essential ones as well**. This is what Poincaré refers to in the motto quotation: mathematical discussion creates that abstract level, where the common laws of nature and society can be expressed.

The following study set the target to model some of the basic phenomena of sociology and history – which I believe to be phenomena that are easy to generalise – utilising the terms and methods of the most developed empirical sciences.

Consequently, the question arises: is not this study carrying out an erroneous reduction, physicalism, or other unnatural simplification? I have to lay it down: **I do not believe that society or history is object to physical or chemical laws, but I believe that there are common laws of these fields**. Today there is probably no one who would make a grievance of the usage of mathematical statistics in the field of social sciences. Still, what is that if not reductionism: inflicting pale, empty, abstract and unnatural idealisations upon a society lavishing in all the colours of the rainbow, where individuals walk their inexplorable ways drunk with their own subjectivity.

If we set aside our romantic illusions regarding society – or, what is almost the same, regarding humans – that is, **if we disclaim the luxury of the freedom of action and its creative irrationality**, then we have an open way to understanding. Action, human beings, and society are extremely complex, much more complex than nature, and we hardly know anything about them. The rules are also so complex, and there are so many of them, that they seem to extinguish each other. This is why human beings and society seem to be undetermined.

However, it is easy to see that absolute chance and absolute determination may overlap. Let us suppose that we are screened a film, which has a random number on each of its frames. The viewers are to find a relationship between the numbers. As no one is able to find one, they declare that the numbers are undetermined. At the same time, it is clear that the picture strip with the numbers and the prescribed incoherence is the absolute determination itself. I trust that our situation is not this bad; still, the understanding of society has not yet reached the level where at least the silhouettes of the solution are becoming visible.

It makes it easier to find the common laws of nature and society that there are such elementary approaches in mathematics, geometry, chemistry, etc. which are suitable for the depiction and partial interpretation of society, due to their high level of abstraction. At the same time, these terms are not empty generalisations, but quantities explicable through empirical measuring.

This idea can be illuminated through imagery: Let the edges of a pyramid stand for those principles, which penetrate all existing things! The volume of the pyramid is all the information that was collected through experience: either directly or through empirical measuring. If we take a plane section parallel to the base, on the resulting surface there are the pieces of information, which are determined by the principles expressed by the edges to the same extent. However, as we get further away from the apex, the distance between the edges increases, that is, more and more information is necessary to lead us from principle to principle in order to realise a coherent train of thought. The closer we get to the base, the more effort it takes to keep up the explanatory power of our principles. **Namely, to understand means to deduce the content of a piece of information to comprehensible**

fundamental principles. That is, information does not mean cognition, merely experience. **Only the experience pervaded by theory can be regarded as cognition**.

The height of the pyramid stands for the abstraction level of the pieces of information, so that the closer we get to the base the model contains more factual and qualitatively more heterogeneous information. That is, if we approach the apex along the principles, the volume will contain less and less information, which is more and more homogeneous and abstract. The apex is consequently the most abstract, homogeneous and empty but, at the same time, the most perfect as well; it is so because the principles represented by the edges and united in the apex unambiguously determine the volume of the apex, that is, nothing.

Thus, the difficult task of thinking is to elaborate the relationship between the well defined principles on the possibly lowest level of abstraction; that is, to demonstrate the determination exercised by the principles between the most (and consequently the most diverse) things. The low abstraction level is also necessary for the sake of the possibly most accurate measuring, not only because of utilitarianism. It is so, because usually we are presented the phenomena of nature and society not on an abstract level, but in the most heterogeneous and factual form. At the same time most of the things are on this level, so the theory to be elaborated needs to be the most effective here. Of course the phenomena on this level are the most heterogeneous as well, so it is rather difficult to find the trains of thought leading to the basic principles from the inside of the pyramid, that is, from the pieces of information.

To twist the imagery further: finding the appropriate abstraction level between the emptiness of the apex and the complicated heterogeneity of the base is like wanting to enlarge a photo so that it is in focus but it is the possible largest in size. Often the picture is either large but weak, or too small but in focus. Still, there is a point where the two contradictory demands are in a relatively fair accordance: it depends on the focal distance of the enlarger.

In cognition, the following principles are similarly contradictory: the model should have the possibly largest **efficiency** – that is, it should work for the possibly most phenomena; also, it should be **in focus** – that is, each piece of information must be reducible to the basic principles, which produces a clear and bright picture. Another contradiction accompanies this one: the more abstract is something, the less it **can be measured**, but – at least seemingly – the more easily it **can be explained**. And vice versa: the more factual is something, the easier it is to measure it, but the more difficult it is to be explained along the basic principles. This is the basic contradiction of cognition: to understand is to abstract, but to abstract means to back away from reality.

Thus, these principles – **efficiency, logical reducibility, measurability**, and the **abstraction** that makes interpretation possible – are rather difficult to meet at the same time. This is why they are offended in such diverse ways in actual practice.

The most typical faults in sociological cognition derive from the one-track application of the principles, that is, from the lack of parity. The most frequent error is that everything is measured what is possible regarding people and circumstances, but hardly anything can be interpreted. Mainly the coherent explanation traced back to basic principles is rare. On the other hand, manifold and logical explanations are provided for the essentially nothing.

Actually, even the determination of where a piece of sociological information is in the pyramid described above is difficult. Often it happens that in a study there is rather heterogeneous and manifold information from the base of the pyramid, which is not in explicit connection with either the knowledge at the apex or the principle-edges. Meanwhile, there are parts of the same study that are somewhere very close to the apex, that is, their content is nearly equal to nothing.

Yet physics has shown a long time ago how an empirical science should work. Namely, there are data, principles, and mathematical rules connecting these two groups. The latter, however, do not function as a wire used for binding a bouquet together from the outside; already the expression of the data and the principles takes place in mathematical terms. It needs to be so, because it is important that the content of a concept which we use be as much, and only as much, as we need for the mathematical correspondence.

Mathematics makes it possible that the coherence leading to the principles may come about between the data expressed in mathematical terms; namely, that the **logically continuous surface of knowledge** may take shape. Here is where the fall of sociology begins: most of the researchers refuse to use mathematical language, feeling – admittedly or not – that the sociological quality of information is harmed by expressing them in terms of mathematics. Many think that it is ab ovo impossible to translate the irrational and experiential-subjective social experiences into the strict language of mathematics.

This sounds like saying that in the optical colour theory there is no connection whatever between the individual qualities of colours perceived with irrational, experiential subjectivity, and the measurable frequency of light. This dichotomy may lead to difficulty, but physics did not give in. In the beginning, but even today, physics had to fight the inadequacy of human perception and culture-specific thinking, just as sociology. Everything depends upon the role of quantity between the constituents of a piece of information: whether it is essential or not. In the case of the constituents of a colour, the frequency of light is essential, while it is irrelevant for physics how each person sees the given colour.

I do not say that the essential constituent of each piece of sociological information is quantitative. Neither do I say that the quantitative-mathematical method is the theoretically only one method for providing the coherence of knowledge. Still, it is certain that the quantitative handling of sociological data is not employed to its highest potential.

The main problem of sociological cognition in applying mathematics is that it operates with external frequencies independent from quality instead of quantities that are necessarily associated with the sociological quality. In other words, empirical sociology falls behind physics in that the discussion preceding and regarding the usage of mathematics here and now is missing.

Of course, there are setbacks of the mathematical discussion in sociology that are not apparent or relevant in physics: in case of the quantitative approach, important qualitative traits may be disregarded. More exactly, it depends on the creativity of the cognition how many of the qualitative traits it can translate into the language of quantities. In physics, quality can often be disregarded: it does not matter whether it is the mass of a general manager, or of one hundred kilos of coal. Everything depends on how much the essence of the examined phenomenon is affected by the abstraction generating the quantity; that is, whether the

quantity is an essential trait of the phenomenon or not. In physics, quantity is often the determining, or even the only content of the essence; in sociology – at least practically – quantity is unimportant many times. This does not mean that quantity is usually negligible in the depiction and interpretation of sociological phenomena; what I say is that **usually it is difficult to find the quantity constituting the phenomenon**.

This problem is well known from the history of physics. It is enough to think about the series of failure regarding the measuring of ether. But there is a more everyday approach of the same phenomenon: in secondary school everyone met in mathematics class the bogey of text problems. I think this is the problem for most of us: it is a serious matter how to translate the statements of the colloquial into mathematical terms. Usually the solution of the problem is rather easy, because they are constructed so, that once the equations are put together, a simple algorithm helps to get the result.

The same problem is magnified during the generation of a mathematical model, when not only the mathematical wording is missing, but also the problem has to be put into words by the researcher. **That is, he has to discover in his or other people's everyday experiences the quantitatively relevant information, then to translate it into the language of mathematics, and finally to carry out the mathematical deduction**. Someone may ask, what is this struggle for, with its many hidden obstacles? Why is it worth?

If there was a qualitative logic – not formal or mathematical – with known universal rules of inference, then **the quantitative approach would be unnecessary**. For example, if there was a system of rules in the colour theory that can categorise the subjective colours the same way as the theory based on the frequency of light, one should not toil on the quantitative description of light. However, such a system of rules does not exist, either because it does not exist in nature, or because it has not been discovered. At least neither the natural sciences nor the social sciences have discovered it.

As there is no qualitative logic in sociology either, practically anyone can say whatever he wants to. It is known since Wittgenstein that a considerable part of the philosophical discussion is centred round the absurdities that occur due to the lack of qualitative logic. It is even truer for the language and enouncements of history and sociology, which could be called journalism sustained by statistics rather than science. At least in empirical sociology and especially in history this is the case.

And the situation of theoretical sociology is even worse, because there even the possibility of experiential verification is disclaimed. Theoretical history does not even exist. This does not mean that every statement of sociologists and historians is empty nonsense, but that no one knows exactly what the truth in them is. It was the same with physics before Galileo: Aristotle had said many clever and profound things about physical objects, but – given that he renounced experimental verification driven by mathematical principles – many of his statements proved to be foolish. It is the same in sociology and history today: verified knowledge is substituted by eloquence and erudition, and it is a matter of taste and intuition what on accepts to be right. It is often difficult to point out that such a statement is faulty ab ovo, because for example there are internal contradictions within the study.

Consequently, mathematical models are needed for the sake of verification and credibility. Such models are ab ovo constructed along a controllable train of thought, while they give way

for empirical verification. **It will be settled by the progress of science whether a piece of knowledge is relevant or it is rocky insignificance**.

CHAPTER 1

THE INITIAL QUESTIONS OF THE CONSTRUCTION OF THE SCIENTIFIC ANALOGY

THE CHARACTERISTICS OF THE DEVELOPING SOCIOLOGICAL COGNITION AS COMPARED TO NATURAL SCIENCES

For a long time, the exemplar of experiential sciences has been geometry.
This sentence carries much logical and essential vagueness. Is it not wordiness to attach the adjective experiential to the word science? Science focuses on reality and only reality, so it cannot be anything else but experiential. Still, we know a scientific statement can refer to reality rather indirectly as well, and it is important to know how many steps led from the experience to the concluding statement. Those appropriate statements (axioms) that refer to reality through many or uncontrollably many steps constitute theoretical science. So the difference between experimental and theoretical sciences is merely a matter of scale.
The statements of elementary geometry are very close to insight: some problems, for example the discrimination of the circle and the square, can be solved even by dolphins. At the same time, the axiomatic discussion of geometry makes it possible already on the elementary level to predicate statements that are not at all evident based on insight, although they can be demonstrated later for the sake of insight as well. For example, the thesis "in a triangle the medians, that is, the lines created by connecting the midpoints of the sides with the opposite vertex, intersect in one point" could have never arisen based on insight, and it is difficult even to illustrate it appropriately, due to the inaccuracies.

So, if under the term "experiential" we mean **closeness to reality**, and we understand that not only experiences but also the experientially verified theses are subjects of the science (theory), our first sentence becomes correct.

However, this exemplar means an almost unbearable challenge for sociology, the representative of social sciences, given that it brings into question the established practice. The challenge may be reduced to some extent if we remember that neither geometry nor physics was established in its present form, but they are results of a long development, which has not finished yet. In the following, I will attempt to draw a parallel between the development of elementary geometry and sociological cognition; where it is possible I will draw the conclusions regarding sociology. My goal with this is **to establish the sociological analysis and synthesis**; namely, the way to arrive from the most elementary data (analysis) at complex sociological knowledge (synthesis) that can be compared and integrated.

i. The criterion of the arbitrary selection of problems and methods

Today, when scientific thinking is a requirement almost from kindergarten, it is often forgotten that the processes of the human mind and thinking are basically unclear and chaotic. After all, what is amazing is not that man is able to predicate scientific statements, but that these are only little islands without any significant precedent or consequence among the shoreless, rolling sea of sensory data, representations, fragments of thought, emotions, illusions, hallucinations, foolish prejudices, etc.

Little has been thought about this, although it is very important.

Let us think of the moment, when the first note of a great symphony is intoned, the first sentence of a great novel or of a timetable is written down, the first command of a several thousand lines computer programme is typed in – and from then on chaos is replaced by order. Then, after the last note, letter, or command chaos takes over again. What else is this but the indefensible **autocracy** itself? It seems that man, not being able to handle chaos, artificially terminates, clears and simplifies a piece of reality, which is still very complex, but at least comprehensible: the establishment of some great Science can begin.

The beginnings cannot be justified by the precedents, as those almost totally lack structure; moreover, how could chaos borne order? But the beginnings cannot originate from the end either, as that is usually not known, or it is in such a complex and misty relationship with the beginning that it can hardly guide anything. For that matter, after the end the chaos preliminary to the beginning takes over again: how would the process know that it slips into disorder again?

The phenomenon described above penetrates the whole of human life and thinking, so we have to consider it at the origins of geometry and sociology as well.

At the beginning of sociological cognition, a subset of the practically infinite set of phenomena is taken.[1] This is analogous with the act when in the physical space an arbitrary subset is chosen: a body, a hat, or a tram. This selection is simply the sensation, and the insight following it. The objects of the environment are likely to get into our view in a chaotic way, so the correspondence between them alters from perfect similarity to almost total incomparability. For example, two stars look geometrically similar, while there is no similarity between a cloud and the cover of a railway guide.

Sociological sensation is just the same: it is never perfect; that is, it never embraces the whole of social phenomena and objects, but it jumps here and there sweeping the space as a spotlight, focusing on or even sticking to one object from time to time. The similarity between sociological objects may be just as varied as it is in the case of physics or geometry.

Of course, the question arises: if the boundaries of a science, which include the phenomena and objects we are interested in, are drawn arbitrarily, what ensures that these objects will be the adequate starting points of the science in which we are interested?

In one word, we are looking for the criterion of the right decision regarding the beginning. The principle is not and cannot be merely that our decision should be justifiable perfectly or at least acceptably. Rather, we should be able to tell about the principles, objects and places that are products of our decision, what their properties, purpose, and place in the order of things are. If reality would not allow for arbitrariness, we would never have progressed, as **man is the chaos, which would like to re-establish itself with the help of reality**. If reality was not insensitive – invariant – to arbitrariness, it would be unknowable. **The invariance of reality – as opposed to the autocracy of cognition – is the basis of that reality is cognisable**.

So, anything is chosen, it will be good for something, as the ontological structure of reality is homogeneous: the “fabric of law” is the same everywhere: anywhere we cut into the velvet or linen, we will find the same texture. The universe of our experience is the same: any segment

[1] Tamás Dénes: *A kivételek szerepe a tudományos megismerésben és a kreativitás a kutatásban. (The Role of Exceptions in Scientific Cognition and in the Research of Creativity)* Pszichológiai Tanulmányok XVI pp221-259.

we look at, the same elements will show up. (More exactly, there will always be elements homogeneous with our previous knowledge.) That is, **if the law was not coded into the objects of our experience, it would not be possible for us to put it into them**.

ii. The criterion of closeness to reality

Geometry takes its problems from sensation and insight. Some natural objects require much simpler geometrical arrangement than others do. The Sun or the Moon can be regarded as circles, stars as points, the plains as planes, etc. So the first problems of geometry did not have to be hunted, they were given in experience; that is, their closeness to reality was maximal.
As sociology is manifested in meanings, and meanings are not sensible, only understandable, sociological problems cannot appear on the level of insight. Therefore, the closeness to reality is nearly zero in the case of sociology.[2] Later, when certain meanings become general, sociological problems can appear on the level of insight as well, for example in the form of war, clothing, customs, construction, or the staking of pieces of land. Other problems, however, never become apparent, as they do not have an objectivated projection: their meanings – except for language – remain absolutely intrasubjective. For example, homesickness or faith in God can never become objects to insight. Many sociological problems are not realistic in this sense; moreover, open road is given for pseudo-problems. Therefore, the methods must be found, which can help to convert intrasubjective contents – meanings – into intersubjective ones. Solving this problem will be the task of sociological conversion and analysis.

iii. The criterion of constructivity

Usually the selection of an object or problem is constructive, when everything – and only that much – is perceived during the act of sensation, which constitutes the chosen object. For example, when choosing a drawn triangle, constitutive elements are the sides, but neither the colour of the ink it was drawn with, nor the material of the paper in was drawn on. In the case of natural sciences it is not a problem to distinguish between constitutive and not constitutive elements.

However, in sociology it is problem even to select the object of examination, not talking about the discrimination of constitutive and not constitutive elements. For example, it is easy to distinguish between a circle and a prism, while to tell whether an act is a crime or not requires lengthy preparations, and even then it is not guaranteed that the result will be success. If a couple is killed by a machine-gun burst, it can be regarded as crime or as a morally and politically right revolutionary act, depending on who the two victims are, when and where they were shot, under what social circumstances, etc. What I have in mind is the death of the Causescu couple in Romania. Thus, not only the examination of the sociological object, the crime, is a problem, but even the determination of what the object to be examined is.

Especially in political science it causes remarkable confusion how to handle people like Hasim Thaqui. He is an Albanian politician, who murdered several people in Kosovo during

[2] For the sake of simplifying the discussion, I do not deal with the question, to what extent the thinking was purely geometrical or sociological in the beginning. These sciences – just as all the others – are not born, according to my understanding, at the point when they are given a name, or when they are canonised, but when the first real problems appear. The reflection on society appeared obviously at the beginning, as conflicts enforced it. So, the lack of closeness to reality refers only to that the terms of a problem are not explicitly given, only in a hidden way, mixed with other, not relevant contents of consciousness.

the revolutionary war against the Serbs, and who was arrested for this while travelling through Hungary on the basis of an INTERPOL warrant of caption – that is, he was considered a criminal for crimes involving moral turpitude. At the same time, the EU authorities in Brussels officially negotiated with him after he was released by Hungarian authorities. So, the same **murder** means something different in Serbia, Hungary, and Brussels; namely, in the latter country it is considered as military action, and on this basis Thaqui is treated as a revolutionary hero.[3]

But there are even more simple cases, which point out that in the lives of societies problems are generally and commonly proposed in a non-constructive way. For example, in Hungary the housing shortage caused by the lack of money is an acute problem. So, the government regulates house construction and home loans as well. Still, in the relevant measures such a simple concept as the concept of **room** is defined in two – that is, in contradictory – ways. The result is that those wanting a home – who were supposed to be helped by the regulations originally – cannot get either a house or a loan.[4]

Geometrical objects contain the problem and the data necessary to solve it at the same time. For example, the relationship between the diameter and the perimeter of a circle can be conceptualised by a series of polygons with an endlessly increased number of sides drawn into the circle. So **a problem is constructive**[5] **if, when it is raised, the data necessary to solve it appear as well**. In any other way problems are destructive and misleading.

Sociological problems are usually not constructive: their solution originates from external sources, and not from the problem itself.

Let us say that we would like to get an understanding of the decrease of exchange market prices during a given period of time; we cannot do it by examining the Hungarian exchange market. But, we get closer to the solution if we get to understand the processes of the New York or the London exchange markets, and their effect on the Hungarian one.

If we want to reveal the reasons leading to the peak hours of public transportation, we won't find them in public transportation, but in the employment regulations of the surrounding society, that is, in the regulation of the daily working hours.

If we want to understand the fast increase of real estate prices on the turn of 1998-99, we cannot do it merely based on the constitutive elements of the real estate market. Let the technical condition of and the demand for homes be constant during this period. Still, we will find that the prices increased by 150 percent. The reason is that Hungary became a NATO member in the beginning of 1999, and due to the external stability of the real estate market owners expected foreigners to appear on the market as well.

The above cases are the sociological manifestations of that general system problem that was first conceived by Gödel. He proved that any system cannot be categorical and free of contradictions at the same time. Namely, not every problem within a system can be solved within the limits of the system, because the solution would lead to contradiction. In other

[3] Népszabadság (a Hungarian newspaper), Saturday, July 5, 2003, p3
[4] Népszabadság, Friday, July 4, 2003
[5] Here I am not talking about the existential or constructive nature of mathematical problem solving, but about that a problem is constructive if it can be solved based on the problem itself.

words, we have to give up either the solution of a problem, or the wish to find a theory free of contradictions.

Due to the non-constructive nature of sociological problems, the goal is to reveal the possibly broadest environment of the given problem. Consequently, **sociological problems are holistic**: individual questions can be interpreted only via looking at the whole of the phenomenon. As if in the above geometrical problem the whole of geometry should be mobilised in order to get the approximated value of π, not only the circle and the polygons. Thus, geometrical reality and geometrical problems are **discrete**, while sociological reality and its problems are **holistic**.

iv. The criterion of finding recurring and elementary constituents

The history of sciences shows that over the course of their fight against the chaos they were striving for splitting (abstracting) hardly comparable objects theoretically until they find elementary parts in them; constituents, which cannot be split any further, which can be found in any object, and which will be identical in any arbitrarily chosen object. In geometry such are the point, the line, the segment, or the triangle. These were originally constituents of some complex physical body, but, as they kept recurring in the chaotic percept series of objects, it seemed worth to separate them and examine their individual characteristics.

The formation of sociological elements happens in a similar way: the objects of the chaotic social experience seem to be divisible, and some recurring elements can be identified.

The elementary social fact

Any time we start thinking about an object, independently of its nature (or even, its existence) the question can be raised, whether it is possible to identify **constituents** of this object in our thinking or not. Basically, we can talk about science only if our answer for this question is yes; otherwise it is merely insight. **Insight is the synonym of the non-communicable**, as communication does have constituents and grammar so it cannot express the insight which has neither constituents nor grammar, by definition. This is what Wittgenstein talked about when saying: "**What cannot be spoken of, should be kept quiet.**"[6]

Science, as understood in terms of society, needs to be communicable, so thinking ought not to be regarded as insight. Let us call this characteristic of our thinking (namely, that it is made up of constituents) being **discrete**. The question is how these constituents can be identified. Is the difference provided for us, or is it a result of some process?

In the first case we would just **perceive** the difference, as it is provided for our insight. However, this assumption contains an immanent contradiction, because insight was defined as a thought which is undifferentiated, that is, which does not have constituent parts.

Consequently, the discrete nature of thinking assumes the existence of **mental operations** that can conceptualise (or rather, produce) the **constituents** by recognising their differences. What is the nature of these operations, and what happens during the carrying out of these operations?

Any object can be object to insight; but already the **stating** of that I am in the process of perceiving something assumes a mental operation: I distinguish myself, as a frame of reference, from the actual content of insight; that is, I allow for something **invariant** (the self as the frame of reference) in my thinking, and something that is **variable**, which is the content of the insight. In other words, the apperception of insight (the fact that I "notice" it), or its enouncement assumes the surpassing of pure insight, given that I notice constituents in my consciousness and relationships between them.

With this it becomes clear what the essence of any operation is: **comparison**. This means, that there are no communicable contents in my consciousness other than my thinking, that is, an operation. It is so, because in order to think about anything at all, one needs to carry out at least one operation: establishing a frame of reference; otherwise thinking as such is impossible. And vice versa: a frame of reference does not make sense (cannot be thought of) if it is empty, that is, if it does not contain something that is object to my insight. Thus, the operation does not come later than the existence of the objects on which it is carried out; rather, they are simultaneous. The existing thought is an operation which produces the elements of the operation as well at the same time. **Thought and insight are two functions, or two working methods, of the mind, which are exclusive, but which also assume one another**.

However, the comparison as operation presupposes that the compared objects are divided into further elements, given that another characteristic was associated with them beyond their existence as well. Namely, their consistency or variability was recognised; moreover, this characteristic allows for noticing them at all (by distinguishing them). So, over the course of

[6] (1) p177

thinking the contents of insight are distinguished via comparisons, while inevitably a frame of reference is established, and properties are attributed to the contents of the insight; that is, they are broken down into further elements. This way the process of thinking also shows a kind of **continuity**, as the thought broken down into pieces can appear only in the frame of reference; on the other hand, the comparison itself generates an invariant constituent in the objects by placing the contents into the same dimension (e.g. consistency and variability).

To put it short, the frame of reference and the properties generating the objects make the thought, which is apparent in the elements, continuous. In the extreme case when two compared contents have only one common property – namely, that they are in the same frame of reference – so they receive the common property from the outside, and it is not inherent in them regardless of the frame of reference, they have to be regarded as **independent** from each other. This also means that they cannot be the constituents of each other either, and there cannot be a relationship between the changes of their condition, because that would presume that they have a common property independent from the frame of reference. This independence exists for the observer as long as the circle of the contents that are compared broadens in such a way that no common properties appear. **With the appearance of the first common property the independence ceases to exist**.

Let us see once again how one reaches the first common property! Basically the discreteness of the thinking was increased – by breaking the original contents into more and more constituents – and finally the common constituent of two different contents was discovered. Naturally, the question comes up whether the common element can be broken into further parts. Of course there is no a priori answer. Theoretically only that much can be acknowledged, that at any point in time there are common parts that cannot be divided any further (let us call these **elements**); but nothing is known of the possible further divisibility (at a later point in time), or of the a priori categorisation of the divisible and the non-divisible parts at the given point in time. This can be only the question of experience.

So, as a paraphrase of the thought that if appearance would coincide with reality there would be no need of sciences, we can say that thinking without reality is inevitably without problems; consequently, it is not scientific.

So far thinking was regarded as a process independent from reality, which can be approached in an introspective way. Practically, the hardships begin when it is axiomatically assumed that the breaking down of a thought happens not in a spontaneous way, but due to the influence of reality. Then the following questions arise:

- which parts of reality can correspond with the elements apparent in the thought? **(isomorphism)**
- is the continuity between the parts a product of our mind, or of reality?

According to experience neither of the above questions can be answered satisfactorily under all circumstances. Admitting this fact makes our thinking scientific, besides the search for **methods** that can reduce the frequency of erroneous answers to the above questions. Thus, the theory of a science (the discussion of its cognitive competence) should focus on the relational two problems; namely, what the limits of cognition are in the case of the given science, and how the resulting, always recurring errors can be eliminated **effectively** (in the “input/output” and the “necessary time” meaning of the word as well).

The most important limit of cognition in the case of **sociology** is that it **is an empirical science, which has objects that are for the most part not apprehensible to the senses, not even in principle. (q.v. appendix A)**

This tragicomic situation is closely related to that, unlike in other empirical sciences, the smallest units that are accessible empirically are not simple (that is, non-divisible within sociology) but complex structures.

In most natural sciences there is a natural unit, which can be regarded as one that cannot be broken into smaller parts within the limits of the given science, and which is apprehensible to the senses – at least in principle. Such are the electrons, protons, and neutrons in chemistry; the molecules in biology, etc. In sociology, on the contrary, we usually do not sense what the object of our study is (not even indirectly), but **the carriers of the information about that object! It does not make sense to ask whether it is apprehensible to the senses that someone is a foreman or a Hungarian; just as no one would inquire about who has seen or heard fluctuation or mobility, and so on**. This is why even that is not known if there is something, which can be regarded as the smallest unit within sociology. This possibility is rather improbable, because if we think of the simplest things – e.g. the age or gender of someone – we will see that it is not something directly conceivable, as for example a molecule or a dog, but an abstract construction. Age does not simply mean the time that passed since the birth of a certain person, but also his or her possibly available roles, the related statutes, etc.
Moreover, age **means** all of these things, but not at all in a tangible way, in spite of that all these factors are in relationship with the concept of age and form the behaviour of the agents. At the same time, the meaning of age as a variable cannot even be circumscribed in advance, because **there is not a necessary internal relationship between the constituents**. Thus, my claim is that at present the conditions that are true for the objects of natural sciences are not satisfied in the case of sociology; namely, that:

- **they are apprehensible to the senses**, at least in principle;
- **their content can be described unequivocally** (without contradictions); and
- **they cannot be broken into further parts within the given science** (on the given level of cognition).

The following chapter makes an attempt to interpret **the sociological concept of element**, and to provide a theoretical method for its empirical demonstration. The first step in the process of meeting this task is to acknowledge that there must be elements in any science, including sociology. This is a necessary step because, as we have seen, the existence of sociological elements is not at all trivial.

The nature of sociological elements

Sociology – just like physics or chemistry – approaches its objects via measuring. The veracity of its speculations or theories depends on whether the measured data will be **the same** as the values expected based on the theory.

Measuring is the same in physics and sociology if it is the comparison of the measuring device and the object to be measured. The dimension along which the comparison is carried out is the criterion. If a criterion is quantitative, then the result will consist of a unit and an index-number, which shows how many times the unit goes into the measured quantity. The results of the measuring are shortly called **data**.

The problems originate in that while in the case of physics comparison in the process of measuring takes place via the **sensory organ**s, in sociology we operate via **cognition**, that is, on the bases on meanings, which are not apprehensible to the senses. **The meanings are apprehended by the mind**.

The second part of the problem is that it must be decided: based on the measuring, are we going to apprehend the elements of the given science, or its complex objects? It is necessary because the more complex the object we are measuring, the bigger is the chance that errors will occur in our work, and that we will measure something else than what we intended to. While in physics it is theoretically possible to measure the elements of the physical object or phenomenon, in sociology this possibility is still to be worked out and discussed.

Meaning, however, is not elementary, given that a whole system of language and a culture is behind it: the sociological data are **coded**. What does it mean, for example, that someone is a foreman? The definition of this concept could fill pages, and it would probably not meet the criterion of non-divisibility by sociological means. Meaning is always arbitrary, and so there is no a priori guarantee that it will be elementary. On the other hand, in natural sciences there is an a priori concept of the element in word or in thought, and the goal is to find its correspondent in reality. (Which may be non-elementary ontologically, but at the given point in time it is elementary epistemologically.)

What is missing in sociology is exactly this concept. (More exactly, it is not articulated; the laws of cognition do work even if they are not known.)

The a priori sociological concept of element originates historically in the comparison of individuals. Why do I **like** Peter and why do I dislike Paul? Why does X give **commands** to Y, and why does it not happen the way around? Why don't I have **money**, and why does Z have it? In these cases the important thing is not to define the concept of "liking," "command," or "money." Scilicet, what matters to me is that any way these concepts are defined, they will be attributes of Peter, X, and Z. Two sociologists may disagree about what money is, or what the relationship between Peter and Paul is, but they will still use the same method: comparing two individuals, and attributing a property to one of them while depriving the other of the same. So, basically they take a **set of individuals**, and **categorise** it via **comparison**. The result is the **variable**. Is the variable elementary from the point of view of sociology? At first sight it isn't, as it has got constituents:
- the set of individuals
- an attribution (criterion of categorisation)
- the categorisation (attributing a property value to groups of individuals)

But these constituents cannot be regarded as elements, just as the code was not elementary either. If we take away either one of the three constituents, the remaining two will not make up a meaningful sociological unit. Namely, sociological cognition does not **begin** when a set of individuals is taken and categorisation is carried out on it. Even biology could do that.

It is a little more difficult to see that sociological cognition does not begin with the identification of the criterion of categorisation. After all, "liking," "command," and "money" are obviously not natural categories. In turn, however, their arbitrary meaning and contradictory usage deprives them of the possibility of being regarded as elements.

If the above listed constituents of the variable separately do not mean the beginning of sociological cognition, how can their unity be regarded as the **potential element**? The reason is that they provide a communicable and verifiable **statement** of the social reality. The operation of categorisation happens empirically, so the statement expresses a **fact** as well. **It is possible, although not worth-while to debate statements; but facts cannot be debated.**

It is possible that the concept of fact was defined wrongly or differently than in other works, but it does not question the fact, only the definition. As the definition is arbitrary, it does not make sense to debate it. The truth of a definition is an empirical question, although not in terms of the facts, but in terms of the prediction. If based on an arbitrarily defined fact we set up a hypothesis regarding a (similarly arbitrary) fact, then the occurrence of the latter retroactively verifies both facts; thus, it ceases the arbitrariness of the definition. **It is so, because while definitions are chosen freely, the relationships between the facts are not: those are determined by reality**.

Nature gives meaningless answers to meaningless questions, but – it can be added, - it answers adequately the sensibly set questions. Challenging this principle means questioning the possibility of empirical cognition. The reason for that it still has been challenged could be that people lingered on that the variable is defined arbitrarily, so the measuring was concluded to be unreliable. **Actually, however, a variable and (the corresponding) statement of facts cannot be either right or wrong**.

Thus, a measured variable is a **potential element** of sociological cognition, because it **cannot be broken into further constituents** with the means of sociology, but it is a statement and a fact, which can be interpreted via these means. In order to illustrate potentiality we may say that the set of statements can be categorised in terms of being sociological or epistemological; that is, whether they can be further divided with the means of the former or the latter one. The potential, elementary variables can be identified when we point out that **a priori** they could be broken into further parts only if we left the boundaries of sociology. However, the other question is whether they can be divided **a posteriori** with sociological means. Exactly this uncertainty is what expresses their potentiality.

The difficulty of the problem is intensified with that the veracity of a variable (and so the decision regarding whether it can be considered to be an element, which constitutes the first brick of cognition) can be expressed only in its relation to another variable.[7] This way, however, a complex cognition is produced, with constituents that are true variables. And, as the veracity of a variable is constantly changing depending on what kind of variables'

[7] Aristotelész: *Kategóriák*. (*Categories*) Kossuth Könyvkiadó, Budapest, 1993. p23

relationship it predicts and whether the prediction proves to be right, the question arises, whether the elements of the sociological cognition are not variable constructions; that is, **shouldn't we talk about elementary constructions instead of elementary variables**? This would correspond to the axiom declaring the **holistic nature** of society.

If cognition is defined as information unquestionable by the given means, then in our case only a variable construction is unquestionable. It is misguiding that, after the prediction proved right, the two concerned variables can be arbitrarily separated, because their veracity proved to be true. Scilicet, any further use of these variables on their own is questionable, as **their veracity is not their own, they receive it from each other**.

Depending on whether the prediction of a variable is absolute or relative, the following cases can be distinguished. Let A be a potential elementary variable, and B, C……N further variables, for which predictions can be made. Let $\Rightarrow$ denote the prediction that proves to be right. (It is the implication of mathematical logic.)

If

$$A \Rightarrow B$$

then we talk about absolute prediction and elementary dualistic structure.

If

$$A \Rightarrow B \text{ (the arrow crossed!)}$$

but

$$\mathbf{A \Rightarrow B + (C+D+.....N)}$$

then we talk about relative prediction, and elementary multiple structure. The latter case expresses the situation when there is no direct relationship between two variables, but they are related when other variables participate as well.

The reason for that the understanding of social phenomena is much more difficult than that of natural phenomena, and that there are so many different theories is that already the elements of the phenomena are rather complex; they are already complexes in their simplest form. Also, the comprehension of sociological elements is difficult because they are easy to mistake for elements of other sciences, and then the decomposition is continued beyond the limits of sociology. This is even more tempting, because – as we have seen – **the origins of sociology begin on a rather complex level**, much more complex than that of natural objects. I see the reasons for this in that:

- sociology operates mostly with meanings and not with percepts (only the carriers of the meaning are accessible to empiricism, not the objects themselves);

- while natural phenomena are observable directly (or through well verifiable mediation), in sociology the phenomena **need to be constructed** first for ourselves so that they can be examined at all. So, from an epistemological point of view, sociological cognition always begins with the examination of the veracity of some complex meaning, and not with elementary phenomena.

Now the question is how one can tell among the different constructions which ones are sociologically elementary constructions (variable-structures) and which are not. As prediction (which produces the true constructions) can be only empirical, in order to demonstrate elementary constructions empirical methods must be used.

The natural scientific ranking of sociological elements

I listed three properties of natural scientific elements, quasi as the ideal of the element. The question is whether these properties stand for the above suggested elementary constructions.

a/ Perceivability

I stated that the veracity of the elementary constructions depends on the non-arbitrariness of the relationship manifested in them. At the same time, **this relationship is the direct empirical manifestation of reality** (as opposed to the variable, which is connected to reality through the mediation of the meaning), similarly to natural scientific elements. In order to apprehend this statement, the analysis of the concept of event is necessary. An event needs to have two basic properties, in order to fill its sociological role. First, it needs to be perceivable; secondly, contrary to the meaning, it cannot assume mediation. If the $\mathbf{a_i}$ value of variable **A** corresponds to the $\mathbf{b_i}$ value of variable **B**, so that this relationship is unique at least in one direction (e.g. $\mathbf{a_i \Rightarrow b_i}$ **, in any case**), then it is such an event, which is set up by ourselves when for example we create a statistical table out of two variables, and we decide their relationship via some statistical or other method. So, the relationship is manifested directly, in its reality; or it is not manifested.

This does not mean that the relationship is a subjective category, but that **reality manifests itself here directly in the human operation**; that is, **it does not make sense to talk about a relationship of two variables independent of the human agent**: society does not carry out statistical trials, and does not create variables.

The event does not contain mediation in any other way: there is no ontological continuity between two events. As two successive castings of a dice are ontologically independent (discrete), two sociological variables are ontologically independent the same way. For example, if the income of women is lower in a society than that of men, no one will think that this is the ontological property of women: there is no continuous ontological relationship between women and their income. This relationship can be only event-like.

The event-like nature of social laws is exactly the particularity, which separates society from the lower organisational levels of nature: from the psychic, the biological, the physical, etc. So, the event-like nature does not only mean that these laws are statistic. Even a system of physical objects can have statistical laws, for example the weight distribution of a bunch of balls. However, while the weight of the ball, and the physical effects acting upon it are in ontological continuity (e.g. the weight and the cubage are not ontologically independent), there is no such continuity between e.g. the gender and the salary. **Income does not constitute gender and vice versa**.

Thus, the relationships between social events do not result in the ontological continuity, but in the dynamic necessities of the event system. Let there be no mistake, these **laws** are not spiritual; on the contrary, they are independent from our will, and are accessible to

experience. So, the elementary constructions meet the perceivability criterion of the natural scientific concept of element.

b/ The circumscribed content

As the criteria of whether two variables are related are not constructed by us, the relationship of two variables is uniquely determined and reproducible by others. So, two researchers may not agree about what they hold to be the criterion of a relationship, but if one criterion is accepted, it can always be decided and reproduced, whether there is a relationship between the two variables or there is not.

It may seem distressing that such arbitrariness is allowed in the definition of the variables as well as of the relationship. Where is then the objective and cumulative nature[8] of science? It must be recognised that the above outlined society-ontology is such, that it allows arbitrariness only in what depends on us (in definitions). On the other hand, those that are independent from us (measuring results and the actualisation of the relationship) overrule our arbitrariness; perhaps they verify it. What I want to say by this is that the cognitive capacities of society and man are such that **it is theoretically impossible to arrive at the same experience based on two different arbitrary approaches**. Originally every sociological school is arbitrary; but on the basis of experience the pieces of knowledge get selected and converge to each other. The negation of this process would be the negation of the cognisableness of society: society cannot be of so many sorts, as there are approaches to it.

c/ Non-divisibility

The elementary structure cannot be divided further, because the relationship is meaningless without the variables. It must be emphasised once again that for didactic or epistemological purposes it is possible to talk about the further constituents of an elementary construction, e.g. variables, their values, etc. **However, these are not the constituents of society, but the properties and constituents of our cognitive abilities**.

[8] cumulativity: a property of cognition; successive pieces of knowledge do not contradict those that were before them in time, but include them as specific events

v. The idealisation of constituents

Sensation, due to its chaotic nature, has two properties at the same time: sometimes it sees order where there is none, and sometimes it perceives order as chaos. It would lead afar to go into details regarding the reasons for this. It is more important for us that the attempts to correct the two kinds of errors **converge**. Namely, if disorder is small, then it is more useful to regard it as order; and if the regular is made a little disordered by the imperfection of perception, then it is worth to disregard some of the disturbing data. The result is that the constituents will be idealized: if the leaves of grass are roughly of the same height, the ends of the blades will seem to merge into the surface of one plane. If four stars are approximately on one line in the sky, and if we connect two of them with an imaginary line, the distance of the other two from the line will be regarded insignificant. If a coin could be tossed in endless number of cases, the frequency of heads and tails would be the same after enough tossing. This is the rule that we never experience, so we never see, perceive the order. But if we are satisfied with approximate equality, then it is possible to experience the (approximate) order after a finite number of cases.

Some objects are so complex, that it would be impossible to describe them without idealisation. In this case idealisation or simplification is the method to be used. However, the idealising way of thinking is one-legged, as the possibility of correction is not built in. It is never actually true that the circumference of the polygon drawn into a circle equals to the circumference of the circle, but arbitrary accuracy can be reached via the increasing of the number of sides. Geometry takes great advantage of idealisation. For example, Euclid's geometry is so much idealising that is loses truth on the way: our world is described more accurately by non-Euclidian geometries. However, the difference is practically insignificant among circumstances on the Earth.

In sociology idealisation is usually different, as – due to the ambiguity of meanings, the desires and interests of people, and the difficulties of verification – it is easy to state anything either in the form of falsehood, or as benevolent ignorance.

Social perception and the peculiarities of social existence favour idealisation. The homogeneous space of social existence is made up of meanings. Structurally the meaning rests on two pillars: one is the mind of man, where the meanings are coded in linguistic and conceptual form. The other is the pieces of reality to which these meanings refer. Two people can have a great conversation based on the meanings coded in their heads, without any basis from reality. Moreover, according to Kant even a person can become the captive of the idealisation of meanings, if he behaves on the marketplace as if his purse was in his pocket. **So meanings exist in two copies: in our head, and in reality; and this is the origin of many problems**. The apprehension of society is difficult not only because it is coded in meanings, but also because the validity of the right and existing meanings is rather idealised.

In conceptualisation it is very difficult – not to say: impossible – to handle the holistic nature of social phenomena, as a concept is essentially definitive, while the things, due to their holistic nature, stick out, and do not fit the sphere of operation of the concept. However, as **the whole is not communicable, only parts**, one should strive to separate in thought and in communication the parts that can be thought about and communicated. Nevertheless, this separation **reduces the holistic reality**, and the error committed this way is manifested in the form of idealisation.

Let us assume that the survival of an predator depends on whether it is able to eat its vital food alive. If it is able to, it will survive, otherwise it will die. Certain animals, for example snakes, are able to swallow their victims alive; sometimes it is even possible to see the victim move in their stomach. On the other hand, other animals e.g. lions tear their victims asunder before eating them. Thus, it is clear that **the lion cannot be an animal which needs to eat live animals for survival**.

Similarly, **if truth is lost when the holistic society is torn into concepts for the sake of cognition, then society is not cognisable**. There are signs pointing to this. Talking with everyday people and sociologists, reading the press, one can meet the most stunning, but at the same time shell-proof misconceptions. One can often ponder on what these contradictory opinions are worth in practice; how is it possible with the cooperation of people holding such different views that there is an organic social existence, which does not fall apart. Seeing the many times total dullness and falsehood, one should think that society works in absolutely different ways than what one imagines, or the participants constantly lie, while they act in reality belying their principles.

I concluded that there is only one way **to conciliate this contradictive nature of opinions excluding each other and the action itself, and the unquestionable continuous existence of society. It is to assume that the social opinions are only one constituent – perhaps changing from moment to moment – of the social action, while there must be other constituents responsible for the continuous existence**. To use a physical analogy, the peripheral speed vector of an object moving with even speed on a circle is constantly changing, while the vector of its angular velocity is constant.[9] **Thus, social idealisation is nothing else but the stiffened projection of the momentary situation and interests of individuals**. Its veracity does not depend on what is said but on the momentary function it fulfils in the constantly changing life of the given society.

Therefore, society should not be described along the line of opinions and concepts, because that means killing the object of cognition in the process of gobbling it up, while we want to incorporate the living truth. One should strive **to apprehend and describe society in the possible most holistic and invariant way**, and then to incorporate the details interesting for everyone into the gradually unfolded whole. It needs to be realised right at the beginning that the approximation of the circle's circumference via a triangle is rather rough. The same way, one can put together only almost indigestible, arbitrary avulsions, instead of the puzzle of the desired, unabridged whole. However, it must be trusted that after a finite number of steps we will reach the humanly possible perfection; that is, that the whole of society can be reproduced on paper with the desired practical accuracy.
Still, one must be aware of the contradiction that the whole is searched via the parts. This is a contradiction penetrating the whole of society and human existence, not only sociology. **"Everything that was whole is broken, every flame blazes partially,"** as Ady writes painfully.

Without exception every science deals with the carefully separated finite details, and leaves synthesis for philosophy, or for the active person, who – worn away among the different details – is looking for some optimal combination and so synthetises under the pressure of necessity. For example, science provides me with the car together with the related immense amount of information, and creates a theory about human motivation, but does not say

[9] László Holics: *Fizika 1.(Physics 1)* Műszaki Könyvkiadó, Budapest. p92

anything about whether I should sit in the car here and now and drive to Székesfehérvár or not. It is a question whether the possibility of synthesis exists at all in the given moment, or to what extent it should consist of scientific details. Also, it is a question whether every piece of scientific detail is given in a certain situation theoretically.

At the same time, the continuous operation of society is obvious, so it seems as if society has already synthetised all scientific information. The situation, again, reminds us of that there are circles and polygons, but no polygon exists with the same circumference as the **dπ** circumference circle. It would occur only in an endless process, which – in a way – has been played out by nature, creating the circle with its circumference. Translating this to the language of society, we can say that every active person endeavours (more exactly, fulfils unconsciously) to act along the operational laws of society. If it was not so, there would be no society – but this endeavour can be realised only partially.

vi. The matching axiom

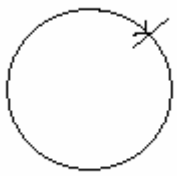
Of course, the question remains: if every action is fractional, how can society work perfectly? (Under perfect operation I mean that the something which is examined by sociology has existed for thousands of years. So, perfection does not express evaluation; rather, it means that society exists evidently, but comes upon explanation.)

The matching axiom helps: just as it is possible to put together a vase from its numerous irregularly broken pieces, which do not show much resemblance to the original whole one by one, the imperfect actions can be joined into the operative society. But the matching happens dynamically, not as in the case of the vase, where the shatters are stable. **The dynamic matching is carried out by the social conflicts, in which the matching actions are formed**.

One form of social conflict is what sociology experiences when it bumps into the fact that its theories do not overlap with reality. Namely, the sociologist is just like the everyday actor, only he is of a different degree. The everyday actor creates some plan of action, more or less unprepared and unconsciously; this causes some conflict during the actual action; which causes the actor to make some changes to the plan; etc. (It would be splitting hairs to also consider that there are existing but unconscious parts of the plan. Moreover, there is probably more of them than of the conscious ones.) The plan of the sociologist is called theory, and it is always in need of correction. It differs from the plan of the everyday actor only in that there are more conscious and verified elements in it.

vii. The criterion of categorical cognition

(Element and category are the concurrence of the starting point and the endpoint of a circle)



Thus, the train of thought outlined above sets the target to strive for the apprehension of the whole in the creation of a theory already at the beginning, even if it assumes errors and superficiality, given that the possibility of unlimited refinement is granted. As the whole may be approached only trough the parts, such constituents need to be found which are categorial. **Categories are the generalisations of the elements: the inversion of being indivisible is being non-unitable**. In this case the operation cannot be continued either, but not because the given object is so small that it seems to be homogeneous (by the way, it would be a peculiar ontological property of the world if homogeneity would twin with smallness, or would be its consequence). On the contrary, uniting the heterogeneous properties of objects into less and less concepts which are more and more homogeneous, we get ever increasing sets of the objects along less and less properties. Finally, we get groups with properties that cannot be united any more. These groups are the categories, as due to the uniting process properties come about which cannot be defined via anything else but the process of the uniting itself; that is, they cannot be subordinated to a more abstract concept.

The element is a single homogeneous object; the category is a set created on the basis of the elementary properties of inhomogeneous objects, the number or frequency of which can be of any magnitude. Categories penetrate the whole of the possible phenomena and objects. Elements and categories owe their existence to the fact that neither the division nor the uniting can be continued endlessly.

At least three categories exist in society: possessions (P), knowledge (K) and power (A). There is no social phenomenon without these.

viii. Looking for the relationship between the elements: the sociological synthesis

After the selection of the elements (fundaments and basic principles), the development of geometry continues with the formal explication of the relationships between them. This basically means that at first theses are deduced from the basic principles, and later the more and more complex geometrical objects are construed on the basis of the already verified theses. In sociology this verification process is absolutely missing. The main reason for this is that at the present level of knowledge the axiomatising of sociology seems to be unaccomplishable. But if we turn to the other model science, physics, we find that the development of this science lacked the axiomatic explication for a long time as well, and was confined to adopt the ready-made rules of conclusion from another science (mathematics) which it could not produce on its peculiar field.

As the first way is so far impracticable, sociology needs to follow physics. There are similar procedures in geometry too. For example, Klein did not prove the consistency of non-Euclidian geometries within the limits of these geometries, but via an indirect method: he showed that if there are no inconsistencies in Euclid's geometry, then it must be the same with the corresponding alternative geometries as well. That is, he put together two theoretical systems, or two methods, and he concluded the consistency and adequacy of the unknown system from the consistency and the adequacy of the known one.

The adoption of mathematical, physical, and chemical models sets the same target in this case. There have been such endeavours in sociology already at Comte, and there are some such attempts known from later periods as well. They usually aroused repulsions, as the trap of reductionism is difficult to avoid in the case of these methods. **But if we duly note that the adoption of a verified model does not necessarily mean the extension of its validity, only**

that its logical structure is adopted, then the method cannot be accused with reductionism. The above-mentioned thinkers usually committed the mistake of trying to adopt also essential elements into sociology beyond the logical structure. Or, so that they are not looked down upon and held foolish, they did not draw clear borders to the analogy. However, this process is lacking from present day physics as well; there is the danger in some cases that the mathematical constructions serving the description of the physical reality would set up for themselves, and **insubstantial mathematical models would raise to the rank of reality**.

Prediction is decisive in the delimiting of the borders of an analogy. Only that analogy is right which predicts social occurrences adequately, or even more adequately. No one panics when the methods of mathematical statistics are used for the description of bearing balls and human masses alike, and nobody thinks that this would mean the reduction of people into bearing balls. Yet this is exactly what happens, as we consider out of the numerous properties of people only those, which correspond to the properties of bearing balls. If we accept that science is the objective description and explanation of reality, this would bring human and natural occurrences to a common denominator. One can avoid this only by taking out man from nature, which would also mean making him impracticable for science. Of course, the possibility of reduction exists, as every other form of erroneous thinking. **But only because it is possible to think abusively, thinking itself should not be discarded**.

ix. The constituting quantities

Several theses of geometry could be explicated without numbers. Additional theses are necessary so that a relationship come about between the geometrical objects and the numbers. In the case of geometry this relationship is so perfect that geometry can be expressed solely with numbers; that is, the relationship of numbers and geometrical objects is mutually unique.

In sociology this correspondence is crude yet, consequently it is often missing as well. The relationship between numbers and sociological objects is based on hazy preconceptions, and ad hoc procedures. In different sciences the relationship between the object of examination and the characteristic quantities is created via the help of constituting qualities and quantities. The role of constituting quality has been discussed under the third axiom, that is, constructivity.

What a constituting quantity is, can be best – although rather theoretically – shown in geometry. Here the constituting numbers are inherent, that is, the elements and the numbers are identical. In geometry it does not make a difference whether a thesis is proved logically, that is, via the axioms and theses of geometry; or mathematically, for example with the tools of analytical geometry, that is, numbers. Chemistry and physics are less formal, so they are more like sociology in this respect.

In order to understand the situation of sociology we need to proceed from the nature of its data. Sociological data without exception assume communication, contrary to data of the natural sciences, which are perceived directly, through our senses. We learn of the **sociological fact**, or, with the words of Weber[10], we conceive it. This information takes up the form of an anyhow circumscribed concept, which is identified with the statement of facts. For

[10] Max Weber: *Gazdaság és társadalom*. *(Economy and Society)* Közgazdasági és Jogi Könyvkiadó Budapest, 1967. p41

example, the age, gender, domicile etc. of a person is registered, but these data do not necessarily have a quantitative constituent; moreover, they usually do not have such content.

In some exceptional cases, the concepts intended to register a statement of facts seem to conceptualise numbers: such are the age, income, the accomplished years of education, etc. However, the appearances are deceptive: these are not real, existing numbers, or if they are, they do not belong to the concept because they did not evolve based on a real calculation or the substitutive measuring. For example age, as a number, does not say anything about what it means in a society to be a child or a greybeard. The period from the date of birth to the moment of the questioning could as well refer to the period between the production of a refrigerator and its being taken into inventory. Only biological conclusions can be drawn at best on the basis of the age, but those are also doubtful. The reason for the insubstantiality of the age, as a number, is that the passing of time, as opposed to clockworks for example, is not handled objectively by societies, but symbolically, and according to the social laws. So the age may be a number, but it does not say anything about the social role, because no information is provided by the sole knowledge of the date.

But most sociological concepts cannot be quantified to even this extent. One cannot order a number to right-wingism, or to Protestantism, but either to masculinity or to femineity. However, in reality it often happens that a code number is ordered to even the most impossible things – like the satisfaction or discontent with a job – and although everyone knows that these codes have nothing to do with the content of the concept they will be handled as numbers. It is difficult to acknowledge that some phenomena and objects simply do not have quantitative properties: one cannot get on a tram by halves, die in a quarter part, or a woman cannot be half pregnant either. One should not be deceived by the fact that the people travelling by tram, the dead, or the expectant women are counted. In this case the accomplished statement of facts is counted, and not its measure. **The concepts registering sociological facts are mostly qualitative, without a quantity**.

In sociology, the established procedure is to count statements of facts in a **certain amount, which is a correct method in itself with regard to mathematical utilisation. Thus, the sociological data become finished: they consist of a qualitative and a quantitative part, which are in no relationship whatever**. The practical sociological content remains without quantitative description, while frequency is elaborated on in the most complex ways, with refined mathematical methods, and finally sociological conclusions are drawn from them. It is similar to trying to comprehend the meaning of the words in a language based on their frequencies, or the statistical correlation of their incidence rate. The letters “e” and “a” are the most frequent ones in Hungarian language. Their incidence within the paragraphs of a book will certainly show a high correlation, but it will not say anything regarding their meaning. It cannot, as they do not have, a meaning. **This is the ideal type of the characteristically empty, but absolutely dependable statistical analysis**.

In addition, the adoption of statistics from natural sciences to sociology is questionable as well. Statistics cannot exist without an arbitrary and preliminary ontological conception. Namely, it is necessary to assume that there is a structural relationship between the variables measured on the elements of the population, which can fluctuate between certain limits; this causes the statistical nature of the relationship.

For example, if the population consists of sheep, there will be a strong correlation between the number of heads and legs, but certainly, there will be some sheep with two heads or three

legs. It is a little less trivial to examine the relationship between smoking and pulmonary cancer, but it can be done only because it is assumed that there is an objective interaction between the substances of the smoke and the cells of the organism. However, we have no idea of the possible ontological relationship between left-wingism and religion, or the number of Nobel-prize winners among the people belonging to a certain minority religion. It is demonstrated in vain that the proportion of Jews and Protestants is higher among Nobel-prize winners than the ratio of Catholics and Islamites; we have no idea about the reasons behind this phenomenon, or about what its preconditions are. Moreover, one cannot order a number to the concept of left-wingism, as opposed to the concept of a sheep leg.

Every sociologist who has analysed surveys knows the phenomenon that when preparing the tables containing all of the possible relationships between the variables of the survey one gets a lot of statistically acceptable relationships, among which many cannot even be interpreted. These tables are of course discarded right away, because nobody wants to become ridiculous before the public. So the appearance evolves that sociology is the science of valid and interpretable statistical relationships. I have found a relationship between belonging to a certain party and owning a refrigerator, or between owning a floor-polisher or a radio; the strongest correlation that I have ever found was between listening to the radio in the mornings and buying Hélia D products. I do not have the faintest idea about what these relationships mean; why do MSZP (Hungarian Socialist Party) members have significantly more refrigerators than members of SZDSZ (Alliance of Free Democrats). These relationships will probably always remain the never solvable mysteries of science.

When using statistics, it is essential either to have an unverifiable presupposition regarding the inherent relationships between the elements of a population, or such a phenomenon has to be examined where only the external properties of the elements are important. For example, in statistic physics it makes sense to calculate the medium speed of molecules, because it is the characteristic of an external property, motion. It also makes sense to set up the relationship between the medium speed of gas molecules and the temperature of the gas, as both are external characteristics of the population, and not of the molecules.
However, in sociology it does not make much sense to set up a relationship between the average income and average consumption of the population in a given society, because the income and consumption of individuals is connected within the individuals just as the income and consumption of the population is connected within the whole society. In such cases statistics cannot set up its ontological preconception, because it cannot be perceived – as opposed to the head and legs of a sheep. By the way, this ridiculous example illustrates well that the relationship between the heads and legs within the flock is the same as between the head and legs of one sheep.

A sheep is constituted of one head and four legs. How could we carry out such a reliable and firm constituting in sociology? The constructing of the analogical model of society must clearly start with the definition of those standard quantities, which are regarded by physics also as standard quantities. These can be divided into two groups.

A/ variable standard quantities and their units
B/ constants

Both groups carry numerous difficulties when one wants to apply the related concepts sociologically. The reason for this is that the data containing the standard quantities – except for one – are not the results of direct measuring. For example, one of the most important but

at the same time the simplest standard quantities of physics, distance, is not introduced to sociology the way it was to physics: in the latter case the distance taken by a car can be measured even by a metre-stick. In sociology, when we talk about the distance between two strata – for example semi-skilled and white-collar workers – there is no device for measuring this distance. This is not because the usable metre-stick has not been invented, nor because the distance is only imaginary. The problem is that the distance is not perceivable directly through our senses. This does not mean that the distance is not provided for experience, but that it is not provided directly; that is, it needs to be construed from other kinds of experiential data. The situation is similar regarding astronomical distances – for example the distance between the Sun and Jupiter – most of which cannot be measured directly even today.

Sociology is an experiential science just as physics, and it is known that the standard quantities of the latter had gone through a long process of development before they assumed their present form. I do not mean here merely the standardising process, as in the case of distance, but also the creation of constructions, just like in sociology; although by now the latter is partly faded. For example, the current intensity or Planck's constant is not at all as self evident as distance or time, which are available in physics for insight, for perception.

In sociology the situation is even worse because here neither the concept of standard quantity nor that of unit has come up. Even more catastrophic, the one who attempts to measure will sooner or later bump into the constants. However, sociology has not even heard about the quantities corresponding with the **constants of physics**. Yet the significance of these is remarkable, given that they express what is independent from the logic of the constructed models; that is, they are such **non-deducible remainders**, which obtain their explanation directly from the structure of reality. Such are the mass of an electron, the gravitational constant, etc.

The conceptual beginning of every science consists of sets of such idealised and homogeneous elements, which are derived from sensory data – that is, basically from objects of reality – via abstraction and simplification. In geometry, as in a science originating in experience, the whole conceptual construction leans on the imaginary homogeneous, static space made up of points. Physics adds to this the motion of the points and the bodies made up of them; together with the dependence of the quality of points and bodies on location and motion. Using a profane analogy, one could say that geometry operates with the elementary frames of the world's animated cartoon, which is filled with motion and colours by physics.

In sociology the elements of experience are meanings, these correspond to the geometrical points. Thus the reality of the analogy between physics and sociology stands or falls on whether we are able to construe the standard quantities of physics for the meanings. In order to do this, the relationship of quality and quantity needs to be clarified, given that **meaning is pure quality to a first approximation**.

a/ The relationship of quantity and quality

Both can be traced back to the concept of similarity. When two or more compared objects show similarity along certain compared properties, a quantity evolves. If the comparison is unsuccessful, we get the quality. It can be seen that the quality, just as the quantity, is at the same time the immanent and external property of an object, as both exist already before the comparison. Quality is the presence of a property in an object, and quantity is the unity quantity of something, as the presence of the property is the unit itself in this case. Whatever

the result of the comparison be thereafter, the quality will remain, at least on a unity level: this explains the ontological relationship between quantity and quality. **Thus, quantity is inseparable from quality on the unity level**.

This must be emphasised because meaning seems to be something soft and indefinable compared to the physical objects, and so it seems questionable that it could be the building material for conceptual constructions of scientific steadiness. However, the phenomenon is just as a firm material of the sociological existence as the material point of geometry or physics. The problem is that while the material point – at least theoretically – is always available for perception and insight, meaning can only partially rely on these. **Meaning is primarily an object for understanding and not for insight, because it largely depends on the state of consciousness of the meaning's subject (Weber)**.

An apple is a directly given, perceivable object for geometry or physics, but for sociology it is also food, which can be consumed by a person. Moreover, it can be a weapon as well, for example, for Piszkos Fred (Fred Dirty), who made Nagy Bivaly (Great Buffalo) believe that what he was holding in his hand in his pocket was a revolver and not an apple[11]. On the other hand, if the apple is made of gold, it can be the symbol of power, for example the orb.

It would be a mistake to say that an apple as food or as a symbol is less existent than as a physical entity, given that one kind of existence assumes the other kind. The difference lies in whether the object is perceived directly or indirectly. **Sociology perceives everything indirectly, so it is more difficult to acknowledge the objectivity and firmness of its laws; however, this is only an epistemological and not an ontological difference compared to natural sciences**.

In every case when such processes take place which do not result from the inherent properties of the objects playing a part in the process, but man is present as one of the agents of the process, one can be sure that after all meanings bring about the actual process. This is inevitably so in every case, and this provides the justification of sociology. No one has experienced that a ball passes the goal-line by itself, or that potatoes and other ingredients join up into a potato soup by themselves. At the same time, it is also clear that the goal is not a consequence of the laws of mechanics, just as the potato soup is not the result of the principles of organic chemistry. **In both cases, human contribution is necessary; and behind it one can find the meanings thought out by the acting individual**. Still, the goal or the potato soup will not remain a spiritual meaning; rather, if we know the underlying meaning they will be well describable even scientifically. **So, the meaning is in a catalyst relationship with physical objects**: although it gets out of the process, but the process could not take place without it. At the same time, it is also true that if a meaning does not catalyse a scientific process, its existence becomes questionable. **Here lies the border between science and poetry**.

b/ The constituting quantity

Thus, the ontological relationship of quantity and quality exists, but it is not known how one can be sure about **which of the several kinds of quantifications will be avouched by the ontological relationship**. The answer is especially important in sociology, because here the mediation resulting from the meaning obscures the real quantitative and qualitative

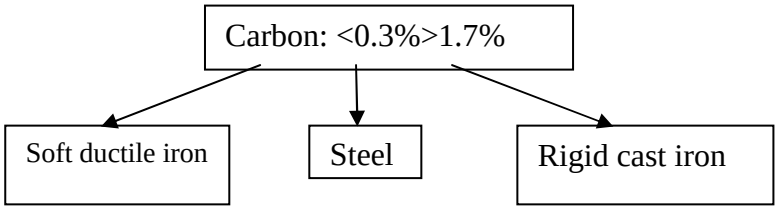
[11] A reference to a novel by Jenő Rejtő, *Piszkos Fred a kapitány (Fred Dirty, the Captain)* – Trans.

relationships. The answer of natural sciences to the question of the relationship between quantity and quality is the realisation of constituting quantities, as opposed to the formal, or insubstantial, quantification.

If I have a yellow ball or an Islamite, it does not change either the yellowness or the Mohammedanness how many I have of the yellow balls or the Islamites; thus, the number of entities is not a constituting quantity.

In other cases the quantity is determining with regard to the quality. For example, the atomic number of chemical elements is in unique correspondence with the quality of the chemical element. Different ranges of the atomic numbers correspond to different qualities, such as gas or solid states. The relationship between the frequency and colour of light could be mentioned as well, which is identical with the sociological situation, insofar the colour comes about via subjective human mediation due to objective physical stimulus. **The colour is just as an experience as the meaning, only it does not have to be learned as the meaning**; but it comes about as the direct reaction of the nervous system to measurable physical effects, and shows an objective consistency until the nervous system operates well or the physical circumstances do not change. In these cases the constituting quantity and quality are connected necessarily and without contradiction.

In other cases the situation is more difficult, but in effect it is the same as above. For example, if the iron is absolutely pure – it does not contain any carbon – it will not be flexible and solid but soft and ductile, that is, it will not be steel. But if there is much carbon in the iron it will not be flexible and solid – that is, steel – either; it will be cast iron, which is fragile and inflexible. That is, if we define strength and flexibility together as the "steelness," or steel quality, then this quality will be in a rather contradictory relationship with the amount of carbon in the alloy. Steeliness, as a property, will not increase boundlessly if we keep increasing the carbon content; at the same time an insignificant amount of carbon will result in disproportionate changes in the properties of the alloy



Thus the carbon content is a constituting – not external, but inner – quantity of steeliness, as a quality. **Now the question is whether sociology does have such constituting quantities**.

c/ Constituting quantities in sociology

As in natural sciences, constituting can be carried out only experientially. As one cannot figure out the atomic weight of iron, one cannot make up the quantities of power, knowledge, or different possessions.

It is difficult to find the quantities inevitably determining the sociological quality of individuals in the chaotic social experience. Probably everyone agrees that there is a qualitative difference between a dollar queen, globe-trotter, female gipsy violinist, and a Hungarian unemployed unskilled male worker, but no one knows what kind of necessary

quantitative relationships are attached to this difference. We do not know how these two obviously existing different qualities can be quantified. In chemistry, for example, the difference of gold and copper was palpable, but lengthy research was necessary in order to genuinely distinguish them based on density at first (Archimedes), then on the atomic weight, and later on the atomic number.

If such quantification is not possible in sociology, then there are several alternatives for theory construction, but out of these one is more insubstantial and valueless than the other.

If there are merely quantitative differences between individuals, then the road is open for the construction of quantified models and measuring, but this will lead to practical and theoretical disinterest. We may learn for example what the buyers of Ráma margarine think about Communism or Greta Garbo, but we will not be able to say anything about what these statements are good for, however firm the statistical relationship between them may be.

However, if we deal with only such sociological qualities, which are not in a necessary relationship with any measurable quantity, it makes measuring impossible, and discredits the establishment of qualities. Namely, qualities cannot be measured, and cannot be related to each other either. The concepts of culture and freedom have thousands of interpretations, and neither of them can be selected based on a quantitative criterion, because if this was possible, only one of the meanings would function. Therefore, there are thousands of interpretations of the relationship between culture and freedom as well, and neither of them can be chosen as the perfect one. **That is, the questions asked from the qualitative point of view are either not answered by nature, or they are answered insubstantially**. For example, it often happens that the questioner has the surveyed to rate something: “Are you satisfied with your job?” Either we get a yes or a no answer, but we will not know what satisfaction is, neither why it exists, so what its substance is.

Reality can answer only quantitative questions substantially. Consequently, the different speculative theories keep on existing and proliferating for thousands of years, while social sciences are desperately carrying out measurings without the cumulating of social theory.

x. The approximating nature of explication

Among the theses of geometry those are in majority, which can be regarded as definitive, provided that a proving is definitive until the utilised theses and axioms are commonly accepted. In geometry the approximation methods of verification are rare, but accepted. Any statement related to the approximating polygon and the circle can be regarded right as far as one is contented with the predetermined accuracy of the prediction; similarly, due to the confusion and non-axiomatised nature of sociology, one must be satisfied – mainly in the beginning – with the approximating proofs. Of course, it is so only if in each case the method of unlimited refinement is also provided. Sociology usually violates the principle of approximation so that either it represents a statement hurriedly as definitive, or introduces several limits to the statement, usually only blotting this way what it originally wanted to say. It is less frequent that the statement is right but the method of refinement is missing.

The approximating nature, however, is to be understood not merely for the logical structure, but primarily for the prediction. Geometers usually pridefully averse to subject the statements of geometrical theses to experiential verification: a geometry is true even if it does not say anything about experience. At the same time, the geometrical regularities experienced for

example in optics or in the motion of heavenly bodies were not accepted, but experimentally checked; moreover, the geometrical model could not even be constructed without the experimental measuring of certain parameters. Kepler, for example, maniacally adhered to the idea that in the relationship of the Sun and the planets perfect bodies play a role. He spent several years to verify this nonsense. His endeavour was so far right, that one of the a priori models of geometry must be true for the solar system as well. The problem was exactly which one that is. However, it was impossible to choose from them a priori, as experience is not a priori. Later he was experimenting with the perfect circle, which did not lead to any result either. Only the recalcitrant ellipse proved to be adaptable. **Now what is the truth of geometry good for if one cannot choose from its suggestions merely on geometrical basis**?

The contradiction is obvious, because if a geometrical model was true independent from experience, it would not have to be verified. The situation is similar to when an ill person prays to God, but he also calls the doctor. **Each geometrical and mathematical thesis becomes verified when it is applied**. What are the geometrical rules of refraction worth of, if they are never applied to experienced refractions?

Similarly, sociological models are not interesting in themselves, only if they are used for predictions, which is at the same time the verification of the models. The problem is that the testing of these models is much more difficult and fragmented than in nature. So the principle of approximation also means that due to the limited nature of social scientific measuring, ab ovo unrealistic simplifications must be carried out. This leads to the above-mentioned idealisation as well. But if the model makes it possible to handle also life-like data, the principle of the approximating nature of explication can be applied.

Data management: the sociological measuring and analysis

Measuring in social sciences

Communication

In the beginning of sociological measuring there are meanings. Meanings are acquired by people during the process of socialisation, and all of their further actions take place with the mediation of these. The genesis of meanings has a complex historical, social psychological, and biological basis, which is mostly not unveiled yet. For this reason, this study does not attempt to reconstruct this process either, but accepts it axiomatically that the life of society takes place through the medium of meanings. This is unquestionable, and sufficient for the further explication of the subject of this study.

Measuring is based on that unverifiable fiction that the carrier of the meaning – the individual – uses the words in the communication of the measuring process the same way as the one who is carrying out the measuring.[12]

The methods of sociological analysis

Quantification

Thus, at the beginning of the measuring there will be meanings, concepts, or qualities regarded as mathematical unknowns, which are of social origin. Later these are counted in a population or sample, and the numbers obtained will be the frequencies of the meanings.

The structure of the sociological data is a meaning (a word or a more-or-less simple sentence) regarded as constant, ordered to a frequency number. For example:

Clerk ⇒ 82

which means that in the given sample 82 clerks were surveyed, or that in a document the expression "Clerk" occurred 82 times. The actual meaning of "**Clerk**" can fluctuate between wide ranges. It is defined in vain the most accurately; it is not at all granted that the surveyors and the surveyed will use it rightly, or that the definition will suit the actual situation.

Actually, the **holistic nature of society** is responsible for the failure: the **defterdar** (Turkish financial officer) was a clerk in his time, but he cannot be identified with today's **tax consultant** who works on a computer as a cog-wheel in a huge apparatus. The difference in the two meanings can be found in the difference between the general conditions of Hungary 400 years ago and today. Only if putting them in this comprehensive framework can one understand the difference between the **defterdar** and today's **private tax consultant**.

It may be disillusive to think about that sociology deals with the frequency of such blotted words. "Where is the colourful cavalcade of society in all of this?" one might ask. The self-righteous answer to this is usually digging up bulky reference books, and pointing out from the top of which theoretical tower the given concept was dragged down. Actually, when one

[12] Bourdieau: "L'Opinion publique n'existe pas." Les Temps modernes, January, 1973. pp. 1292-1309.

enters reality's shower of blood, sweat and stupidity, these towers become what they really are, that is, ordinary words. As the face of the king on a coin becomes blotted and worn by dirty and sinful hands in the circulation, every specific meaning wears away from behind the words, except for the everyday meaning of the word. The concept of "routinish symbol management and transmission, of low prestige and income" would be difficult to explain to a postal worker, and especially it would be strange to ask him whether he identifies himself with this definition.

Let **x** denote the constituting quantity of meaning **X**! Then the sociological datum has the following structure:

$$\mathbf{X \Leftrightarrow xg_x}$$

where **x** is a real number and $\mathbf{g_x}$ is a natural number. In the latter the index means that **g** is the frequency of meaning **X**. If this series can be equated to a known quantity, we get a simple linear equation:

$$\mathbf{xg_y = b}$$

If we constitute groups from these meanings, the group will consist of the sum of linear polynomials:

$$\mathbf{(1) \quad y_1 g_1 + y_2 g_2 + y_3 g_3 \ldots\ldots\ldots\ldots = b_y}$$

Let us assume that $\mathbf{y_1, y_2 \ldots\ldots\ldots y_n}$ are the constituting quantities of the words $\mathbf{Y_1, Y_2 \ldots\ldots\ldots Y_n}$ meaning occupations; then the linear complex equation will represent the occupational composition of the sample consisting of **b** elements. In order to solve such equations uniquely, one needs to have at least as many equations as there are unknowns.

It is clear that if we hold the actual meaning to be the elementary social fact, then we never escape from the trap of the above equation. **In geometry the point is the element, but not the actual point; that results from some geometrical construction**. In sociology the situation is similar: the meaning is an elementary concept, but the actual meaning is not: this is the result of some kind of sociological construction, which, consequently, needs to be set up by ourselves.

Constituting: the calculation of constituting quantities from the frequency table

Out of the arguments of the above chapters, the following are the most important:

the elementary social being is defined on two variables;
the relationship of the two variables must be possible to demonstrate in some way.

The elementary social being must be constructed, because otherwise the distributions of several unknowns cannot be interpreted: we cannot order a quantity to the meanings. The necessity of the construction is obvious also from that in case of several unknowns as many equations are necessary, as many unknowns are present. The simplest case of this is the sociological cross table, the general form of which – assuming variables X and Y – is the following:

	Y_1	Y_2	Y_j	Y_k	Total
X_1					D_1
X_2					D_2
X_i			$XY_{ij} = g_{xy}$		D_i
X_n					D_n
Total	B_1	B_2	B_j	B_k	Grand total

In linear algebra such tables are understood as equation systems, which signify a transformation (mapping). The mapping transforms vector **x** of the **n** dimension vector space into vector **y**. The transformation can be given with matrix **A** of the coefficients:

$$\mathbf{y = A\,x}$$

where:

$$\mathbf{A = [g_{xy}]}$$

If the linear transformation, which is determined by matrix **A**, is not singular, the uniquely determined inverse transformation:

$$\mathbf{x = A^{-1}\,y}$$

exists, and it assigns the original vector **x** to the image vector **y**. Between the object and the image vectors there is a mutually unique correspondence.[13] The equation is also applicable for the calculation of vector **x**. I do not want to digress here to the general solvability of linear equation systems, because that is a clearly mathematical and not a sociological question. In the case of quadratic matrices it is enough to refer to that the necessary and sufficient condition of solving a liner equation system is that the value of the determinant composed of the coefficients of the unknowns should not be zero. In this case there is an easily computerisable algorithm for the solution of the equation system. **Let us look at an example to see what it means to constitute the elementary variable relationship with the help of linear transformations!**

	Employee	Manager 3	Manager 2	Manager 1	Total
Elite	205	7	26	7	245
White collar	167	10	9	2	188
Blue collar	567	7	6	2	582
Agricultural workers	41	1	1		43
	980	25	42	11	1058

Source: the data of MHB (Hungarian Credit Bank) revised

The conceptual constituents of the first constituting variable, power (**A**), are made up of four power situations in this case. The stratification (**S**) to be constituted includes the name of four large social groups. The frequencies belonging to each meaning can be found in the Total column. The following coefficient matrix **A** belongs to this frequency table:

[13] Viktor Scharnitzky: *Mátrixszámítás. (Matrix Calculation)* Műszaki Könyvkiadó, Budapest, 1979. p265

A			
205	7	26	7
167	10	9	2
567	7	6	1
41	1	1	

The target vector is:

$$c = \begin{bmatrix} 245 \\ 188 \\ 582 \\ 43 \end{bmatrix}$$

The image vector is:

$$\mathbf{h = [h_1, h_2, h_3, h_4]}$$

The linear transformation to be used is:

$$\mathbf{c = A\,h}$$

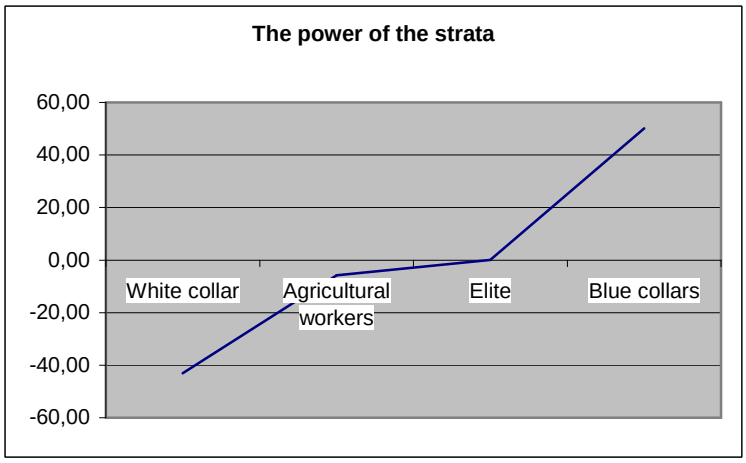
Its inverse is:

$$\mathbf{h = A^{-1}\,c}$$

After solving the equation, we get the following:

	Power
Elite	0.096
White collar	-43.010
Blue collar	50.090
Agricultural workers	-5.839

Plotting the relationship:



One essential characteristic of constituting must be noticed already here: the greatest power is at the zero level. This points out that it is of a reciprocal organisation; it assumes the largest

value at the quantitatively smallest value. This is true for the other variables as well. The explanation of this phenomenon is to be found in a force, which is the strongest in the centre, and decreases drawing away from it.

It is very important that the calculation of the constituting values also means that conceptually given social groups will be quantified with their help, and that **this quantification is not based on statistics but on causality: the equation system orders the constituting quantities to the groups uniquely**. Furthermore, two different constituting (for example that of power and income) will be homogeneous, because they are both the solutions of an equation system. Therefore, a single constituting creates one vector space, where the numbers belonging to the groups originate in the constituting after all. **The assigning of the vector space to the concepts makes it possible to work with concepts as with numbers**.

The generalisation of sociological elements and sociological information

As the land-surveyor, architect etc. of all times do not need to rediscover geometry at the solution of each new problem, but can rely on an established system of geometrical theses, the sociologist also needs such a background so that he does not have to go back to the basics every time. The road of sociological cognition is skirted by abortive buildings; most of them have only the fundaments and some have more-or-less ready storeys as well. Other sciences are already at the level where they are constructing one high-reaching skyscraper. This favourable situation can be attributed largely to that these sciences are provided with a well established concept of the element.

How are the underlying elements and the cumulativity of a science related to each other? (Under cumulativity I roughly mean that the next piece of knowledge is added to the previous one, and they form a system.[(2)]) This could be best demonstrated probably through the example of chemistry. Mendeleyev, with his discovery that behind the elements known at the time the atomic weights play a determining role, traced back every single chemical element to a simpler principle. Later, when the atomic structure became known, the 90 element known at the time could be deduced from the quantitative combination of altogether three elements. These elements were the constituents of several thousand known compounds known by that time, the number of which has increased by now to several millions.

If the efficiency of a cognitive method is described by the extent to which it expands the range (generality) of our knowledge, the principles of the periodic table were remarkably efficient. The geometrical example is even more amazing: since Euclid delineated the properties of the triangle two thousand years ago, these principles have been applied to billions of actual, empirical triangles, and the possibilities of the applicability reach into infinity.

Thus, in a science the elements assure that when we face a new phenomenon (a compound or a new fashion), it can be traced back to our previous knowledge, and it is not necessary to experiment with questionable new principles, new methods. **So, the elements yield a twofold profit: they make the given science cumulative, while they multiply the generality of its statements**.

Due to the peculiarities of social cognition (that is, the ambiguity of experience), geometry is the most likely to serve as a model for the construction of a sociology based on the elements. Kant has already pointed out that no empirical triangle can be a proof for the theoretical

properties of triangles; that is, the theoretical triangle includes a momentum (the necessary connection of the properties), which certainly does not originate in experience. However, no one would say that a person deprived of his senses could have created the theoretical triangle; that is, experience is indispensable for its evolving.

In sociology the situation is similar. One could never create the image of society out of mere experiential data. The reasons for this have been explicated above. At the same time, we do have images of the society, which usually "fit" the data rather roughly. Still, as we are able to acknowledge (actually, to experience) on the basis of arbitrary geometrical axioms with absolute certainty that the sum of two sides of a triangle are always longer than the third side (and this rule is more or less "followed" by actual, practical triangles as well), so it is necessary to experience, or perceive, the relationship established axiomatically between variables measured based on arbitrary definitions. We will never be able to prove it to our satisfaction that the concept of relationship originates in experience, and we can never be sure that the criteria of the existence of a relationship express the essence of the relationship well. On the other hand, the existence of the relationship is the only thing we can perfectly perceive, experience.

Thus, the empirical nature of sociology does not lie in carrying out measuring. This is necessary but not sufficient. Its empirism becomes absolute when it can produce elementary constructions. These elementary constructions are likely to bring about the speedy integration of sociology as well, and do away with the ever-widening gap between empirical and theoretical approaches. It is impossible to set up theories until order is brought into the sea of contradictory and incommensurable data. Such order can be produced only empirically, with the help of sociological elements.

THE CONSTRUCTION OF SOCIOLOGICAL STANDARD QUANTITIES

The most difficult question of using natural scientific analogies does not really lie in quantification, rather in the concepts, which seem to be absolutely foreign to sociological experience. Such are the mass, the gravitational acceleration, the volume, etc. That is, the problem is not only the constructive quantitative management of the models, but also the adoption of the content of the quantities. This can be accomplished only if the contents in question are generalised and extended to social phenomena as well. Actually, this problem is inversely like translating the experience of physical objects into the rather abstract mathematical relationships and into unverifiable axioms. In this case the tangibility and descriptiveness of the experience vanishes, and some kind of elusive abstraction replaces it.

In the case of society the structure of cognition is constructed exactly the opposite way. The misty (**Bacon**), ductile, and seemingly rather unverifiable social occurrences are assigned to very definitive terms, and they are attributed properties which they do not have "according to our instinct."

The question is whether the world of objects does have that basic attribution that "every object remains at rest or in motion with a constant velocity unless a force is applied on it." One must realise that this Newtonian axiom is a rather complex and unverifiable statement, regarding the motion of every imaginable object, let it be a star or a dog at any point in time and any position in space. The First Axiom of Newton, by extending its validity to infinity, adds something unverifiable and complex to the limited experience, which it wishes to interpret: the mystical concept of force. The force is never experienced, only its effect. The basis of this assignation is anthropomorphism and the naive experience: when one lifts a heavy sack, he believes to experience the force. Actually, what he feels is just pain and tension, which could be the result of an amputated leg as well. To conclude from this that for example the clouds and the hills are as well formed by forces is a rather bold assumption to be smiled at. And still: it works. It works, because the meaning of the force does not depend on words, but on the mathematical assignations and operations, which have been carried out behind the expression

$$F = am.$$

However, these assignations and operations remain purely human inventions, that is, they are not directly part of the examined phenomenon: when nature lifts the mist from the ground, she does not calculate velocity, does not calculate the second derivative, nor does she measure the mass, etc; she simply brings about the process. If the Newtonian method is still adequate to what is actually happening, it can be attributed to that what man adds to the lifting of a cloud is of similar structure although of different matter, that to what he adds it. For example, man is a complex physiological entity, and the cloud and air are physical ones. The mystery of force and the geniality of man lie in that he recognises and separates the two structures from their carriers, and equals them to each other regardless of their basic qualitative differences.

When properties holding a certain basic content are attributed to the social experience, this attribution will be even more explicit than in physics. Actually, what we talk about here is a new perspective, the **attribution** of a new approach to experience. In such cases everything stands or falls on whether this attribution is the continuation of the conclusions originating in the structure of reality and leading to beyond experience, or it is ungrounded fiction. For example, when mass is attributed to the subjects of motion, whatever they may be, this mass

is not experienced as, let us say, the reacting of the pram against strolling. But is not there a reacting force within society against changes? Is not the opposition of reaction and progress a well-known phenomenon? Have not we experienced that social ideas, habits, together with the groups representing them, endure for as long as hundreds, **thousands of years**? (For example, the phallus and the vagina, power symbols of the ancient Egypt, still exist as living symbols of power in Ethiopia.[14]) Is it not experienced day by day that every reform and new measure takes effect only with some delay, if it takes effect at all? **What is it, if not the manifestation of social inertia, that is, of mass?**

The social experience limited by the colossal dimensions of social laws does not make it possible to make a specific representation of all the properties of experience. It is like the Klein logic; his model shows the soundness of the thesis "Given any straight line and a point not on it, infinite number of parallel lines can be drawn to the line through the point" – which is contradictory to experience – within an open disc artificially circumscribed from the Euclidian plane. But if one steps out from the sphere of operation of the Klein model, it can be realised trivially that this thesis is not true.[15]

It was sufficient for man for thousands of years if he was able to comprehend the occurrences of his own small group. Today's man has not exceeded this level either; only his group position is changing continuously, hour to hour, minute to minute, almost all through his life. Practically, even the politician or sociologist dealing with society on a professional level cannot make a general representation (above the small group) of society, not even for moments. **The observational method, which is provided for meteorologists in the form of satellite systems embracing the whole Earth, is missing**. Where is such a device in sociology or economics, which could observe the Great French Revolution from bird's-eye perspective, **as a satellite shows the swirling and proceeding of a continent size cyclone**? Today's sociologist or politician relates to a future colleague like the meteorologist who scrutinises the cyclone by tonguing his finger and holding it up instead of using satellites.

In the case of sociology an inverse Klein model is necessary. The conclusions of the social experience created and naturally circumscribed by biological evolution should be lead out from within the borders of the model, and it should be established that there are properties of society, which do not appear in experience, or if they do, it is only partially and in a fragmented way.

[14] Spectrum TV, August 27, 2001.
[15] Imre Rúzsa: *A matematika és a filozófia határán*. (*On the Border of Mathematics and Physics)* Gondolat Kiadó, Budapest, 1968. p284 (The Klein model of Bolyai's geometry on PC)

What we deal with here is the material nature and behaviour of society. This is enshrouded by that society is manifested in meanings, which seem to be swaging in our understanding fastened to an impalpable noumenon, as balloons anchored to the ground or to wind-swept, floating ice floes. The order apparent in the meanings, and the interrelations of the social occurrences would be inexplicable, if we would not assume something behind the meanings, something, which assigns coherence and consistence to the systems made up of series of meaning. The existence of coherence and order is unquestionable even if there are many occurrences, which still seem to be chaotic due to our ignorance. Namely, the survival of either society or the individual is not possible without order and coherence, but it is pointless to talk about social cognition if there are no such properties of society.

Order cannot originate in communication itself – for example from the laws of language – given that in that case the order would deviate from the order of real things, in as many ways as there are different languages. A communication order incoherent with reality would oppose us to the order of the world, and the collision would result in immediate devastation. Unless one believes in miracles, one must think that the essential accordance between reality and communication cannot be accidental; rather, it must originate in the relatedness or identity of the human, social, and natural laws lying behind the meanings.

Thus, when we attempt to adopt six out of the nine standard quantities of physics into sociology, we must seek **to accomplish this with the help of extending or rephrasing the sociological experience**. This aspect has real significance when we are using concepts seemingly foreign to the sociological experience: ones like plane angles, mass, etc. I will not carry out the adoption of the standard quantities in the order customary to physics, because I have to obey the sequence in which the sociological standard quantities appeared in the cognition so far.

i. Time (t, sec)

Out of the standard quantities of physics, time can be easily adopted to sociology, because the present everyday social practice is organised based on the time used by physics and astronomy as well. In sociological practice it is usually not the second (secundum) which is used as the basic unit, but rather the year or its parts. However, of course, there is nothing to prevent us from reducing the data into seconds with the help of the established methods, so making it easier to utilise physical relationships.

ii. Defining distance

Between any points of the PKA system constituted by (one, two, or three) coordinates, the distance can be constituted via the following expression (I will refer to the tree dimensional case, but obviously this stands for one or two dimensions as well):

$$d = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2 + (z_i - z_j)^2}$$

Furthermore, every social difference, to which a distance defined above can be assigned mutually uniquely, will be called distance. That is, we will not require the shift of prices at the exchange market to have coordinates. It will be sufficient if the prices are measured on a proportion measuring scale, so that two prices can be compared as two segments. (See the plotting of functions via graphs!)

iii. Plane angle (α, β…, radian)

We adopt the physical definition without changes.

iv. Amount of substance (n, mole)

a/ The number of the particles of the social system

It is accepted in the practice of empirical sociology that the particles of a social system are the individuals. I do not want to digress to a discussion regarding whether this is right or wrong, or with what it could be substituted. I accept this approach, as at this level of the explication it is actually the same if we regard actions of individuals, individuals, or groups of individuals to be elementary. It boils down to that we have to introduce the concept of the number of particles, which we are able to measure. The number of individuals is adequate for this purpose. It is denoted by **N**.

Furthermore, the sociological amount corresponding to Avogadro's number is also necessary. In the present study this number has no other substance than to serve as a **measurement unit**. Its role is merely to simplify the application of thermodynamic formulas. I could explicate my message also without this unit, but in a much more difficult and awkward way. However, in order to demonstrate that the introduction of Avogadro's number is not entirely arbitrary, I shall make a detour without the claim to completeness.

As it is well known, Avogadro's number is a natural constant of great significance used in chemistry and physics, which expresses that certain processes do not take place by an arbitrary amount of substance, only if a determined number of particles are present. Avogadro's number denotes the number $6.022*10^{23}$ in physics: this is the number of particles a mole of gas (for example) is made up of. The magnitude of the number suggests that its sociological counterpart has to be searched among the largest social phenomena. Such are the number of people in a society. **If Avogadro's number has any role in society, then we shall get to the result that the average of the actual number of people is the product of 6.022 and some integer exponent power of 10:**

$$\mathbf{A = 6.022*10^{n}}$$

Over the course of the examination it is useful to limit the minimum number of people in a society, so that the very low exponents may be filtered out. In 1992, the population of the world was living in 158 states, but only 87 of these had a population larger than 6 million. At the same time, the population of these 87 countries added up to 97 percent of the world's population.

	A	A/60220000
Average	6.01E+07	1.00
Standard error	1.67E+07	0.28
Median	1.87E+07	0.31
Modus	7.50E+06	0.12
Standard deviation	1.56E+08	2.59
Range	1.15E+09	19.01

Minimum	6.30E+06	0.10
Maximum	1.15E+09	19.12
Total	5.23E+09	86.82
Number of countries	87	
Ratio of countries	0.55	
Ratio of number of people	0.97	

Source: The sociological introduction of Avogadro's number (Az Avogadro szám társadalmi bevezetése)

The average of the countries' population was nearly 60,100,000. The quotient of this number and the physical Avogadro's number is

$$\mathbf{10^{-16}}$$

with fair accuracy. Accordingly, the sociological Avogadro's number (**A**) can be understood as the quotient of the physical Avogadro's number ($\mathbf{N_A}$) and the constant $\mathbf{f = 10^{16}}$:

$$\mathbf{N_A/f = A = 6.02252*10^{7}}$$

Therefore, we assume that in the physical model of society the physical Avogadro's number can be used without any changes with a reduction factor **f**. **The emphasis is on the reduction and not on the extent of the reduction**. In fact, the reduction of $\mathbf{f = 10^{16}}$ is not enough. Why it is so, will be answered by subsequent parts of this study. To put it concisely, what I mean is that the thermodynamic model I am going to use for modelling society is originally defined on atoms and molecules. This model can be adopted by sociology only if it is observed that society is made up of much larger constituents, than molecules. For this reason the $\mathbf{f = 10^{22}}$ reduction factor needs to be introduced here. In this case the Avogadro's number referring to society is:

$$\mathbf{A = 60.2257 \text{ individuals}}$$

As we know, there is a relationship between Avogadro's number in physics and the universal gas constant R:

$$\mathbf{N_A k = R = 8.314}$$

where **k** is the Boltzmann constant of physics. As a result, however, the social Boltzmann constant needs to be increased:

$$\mathbf{k = 0.138047}$$

Thereupon, the concept of the social mole number introduced for the amount of substance constituting the social system is:

$$\mathbf{n = N/A}$$

v. The mass

The introduction of mass is a procedure of several steps, because it cannot be produced with direct measuring at present. What can be done here is to pre-indicate the result:

m_0 = 5043 units of mass

This study will get to this number after the construing of gravitational acceleration and status work.

vi. Thermodynamic temperature (T, Kelvin)

The thermodynamic temperature can be determined with the help of the status work (potential energy). At the construing of social temperature I will interpret the following factors identically with the physical temperature:

- the unit of temperature;
- the zero point of temperature;
- the criterion of the equality of two temperatures;
- the sorting of temperatures;
- the definition of the scale law of temperature;

CHAPTER 2

SOCIOLOGICAL GROUNDWORK

The concept of status

The concept of status assumes that to each of the individuals living in a society an amount measured on a proportion measuring scale can be assigned, which is manageable, and which signifies the placement of the individual in society. **Status is the ever-changing property of individuals**. In the course of their lives at first they have no status whatsoever, then they share the status of their parents for a while, during the school years they obtain the possibility of fulfilling a certain status in the future, and in the later years their status will change with the changes in their income, knowledge, influence, etc.

In other words, the alteration of status in time is rather similar to the concept of distance well known from mechanics. There it means the displacement of a point-like object along a segment, along a plane or in space, etc. In our understanding status means a distance which takes into account the extent to which the individual had risen above the zero level of social status up to a certain point in time. That is, it means the achieved status, and it is not concerned with the actual route the individual covered between the statuses.[16]

I will explicate the concept of **status** via the axioms i-x.

i. The arbitrariness of the status problem

The fact that I begin sociological cognition with the concept of status is an **arbitrary decision**. I could start from socialisation, the emerging of the language, etc. However, it seems unquestionable that in today's mass societies the social status – or its sloppy, ordinary counterpart – is a central concept of the everyday and professional thinking as well.

In everyday life the status of individuals is manifested as a possibility for material advancement, the achievement of which assumes concrete knowledge, even if the actors are not or hardly aware of that. The action of any actor of the society we take, it will be demonstrable that the following factors play a definitive role: money, the know-how of the action, and the control practiced by other members of society – usually regulated by conventionality or law.

ii. The closeness of status to reality

I wanted to choose an initial problem, which – even if not professionally – is in the centre of attention. The concept of status, although it is of basic importance, has not been elaborated so exactly by sociology that it could function in practice. Thus, the attempts to produce statuses empirically have all ended in failure. Aside from the several kinds of theoretical approaches, the reason for the failure is basically that researchers wanted to produce statuses statistically, while they did not pay attention to that if the quantification of social reality seems to be nearly

[16] This is in accordance with the thermodynamic standpoint of Caratheodory, which states that the energy level of a system is independent of what kind of states it had gone through. But it also resembles to that the energy conceived as potential depends only on the differences between the levels, as the displacement on the same energy level does not bring about a potential difference.

continuous, then it cannot contain natural groups that are disjunct. Real numbers constitute an infinite continuity, and one has no reason to detach one segment of this continuum from the other parts, based on quantitative arguments.

iii. The constructivity of the status

I am convinced that a problem is solvable only if we are provided the data necessary for the solution as well, together with the problem. It seemed obvious to me that if something is visibly working in real life (and, as I said, the status system is part of the general thinking, and as such, it evidently directs the actions of individuals, groups, states, etc. as well as the public and private talk) the problems must be solved individual by individual, moment by moment, and from place to place. That is, if I see that people continuously keep breathing, I assume it rightfully that they have solved the practical problem of breathing, even if they are not aware of it. Similarly, if I experience that people are thinking and acting in terms of status categories at every step, it must be a solved problem for them, even if they cannot put it into words. Most Hungarians would be confused if they had to analyse their own uttered sentences in terms of grammar, etymology, style etc. in spite of that talking itself does not trouble them at all.

Thus, the extrapolating of the status system from the mass of everyday actions is based on that we must search after the natural rules, which determine the actions of people here and now in a hidden way (but not psychologically or social psychologically). These rules certainly cannot be statistical, as the individual has no chance, not even theoretically, to follow statistical rules in the actual situation, given the particularity of each situation. It is similar to that the motorway is a concrete something at every moment, which the driver has to adapt to, although over the course of the journey the road is constantly changing. If we should adapt to motorway M7 statistically, everyone would be dead by Budaörs.

We must assume that the rule contains quantified and conceptual-qualitative elements as well, as the status is always conceptualised in smaller and larger terms, while we always know within the borders of which quality we decide the smaller, larger, or equal relation. To put it shortly, **we must always suspect the presence of the status, when the public or private talk is about inequality or equality. This is the quantitative side of the status**. Naturally, in such cases it always becomes obvious the equality or inequality of what the talkers mean. For example, an Audi is better car than a Trabant; it is better to live in Rózsadomb (an elite district of Budapest, trans.) than in Kőbánya (outskirts of Budapest, trans.); my boss receives a higher salary than I do, although he does not have a higher level of education; my wife is a better cook than my mother; etc. **This is the qualitative or conceptual side of the status**.

As everything that is attributed significance in society has a quality and a dimension of "smaller, larger, equal," the status can easily become shoreless, what it often does, actually, in everyday life as well as in science. Among other things, this is one reason for the failure of grasping the concept of status.

However, an analogy may be for our help. As the light of a flash lamp may reach the furthest corner of the world theoretically, the quantities and dimensions of social inequality may increase to infinity. This is true. However, it requires a man to recognise on the Moon the light of the flash lamp flashed from the small village of Vámosmikola, Hungary. The same way, there may be, and probably there is, a difference in the income of two homeless persons, but it is impalpable for the billionaire. That is, the "field intensity" of inequality oscillates to a

large extent. As in broadcasting the operation, the prerequisite of radio connection, objectively depends on the field intensity measured at a given point in time, at a given place, and on the sensitivity of the device, **the operation of society depends on the extent of status differences and the sensitivity of the individuals or groups to this difference**. What I state is that **social action depends exclusively on the difference in status, and vice versa, each difference of the status generates action**.

The constructivity of the status is manifested also in its **holistic** nature; that is, any sociological problem we examine, **the solution of the problem will never lead to a status-free social field: there are no problems which can be solved without considering the status, as the individuals cannot be status-free in any sociologically meaningful or significant situation**. Moreover, each action and solution brings about changes in the status; this is how the results of the occurrences are manifested. **The occurrences and laws of society can be expressed by the description of ever moving and streaming positions. The frame of reference in which the positions are changing is called status space**.

iv. The particles of status

The particles, which can be actually regarded as elementary constituents, are generated by the **limited social perception**. Theoretically, the possessions, knowledge and power could be direct elements (**see vii. axiom**) as we cannot deduce them from each other. However, as infinitely many objects belong to these constituents, we can never reach their ends conceptually, that is, we are not able to conceive them as elements. **Social perception** can be for our help. We can create elements out of the possessions, knowledge, and power so that we arbitrarily assign a **resolution level** for them. The resolution level originates in the measuring situation, that is, in communication: we use everyday meanings for denoting the statuses. As people usually think in terms of statuses, this denotation can be carried out theoretically always, given that each individual of every society knows how he or she is called by the others. For example, **"I am a female, ticket inspector, from the countryside….etc.**" These categorisations are the resolution levels of the given individual, under which he or she is not able to define him- or herself with social validity.

Thus, resolution is always communicative, so it is not of the individual but of the society. For example, a ticket inspector from the countryside will insist on that she is also a **Jainist** in vain, because her colleagues will not understand anything out of this, so she will not exist for them as a Jainist. Moreover, there is no point in her saying as a part of her identity that "Sometimes I feel as if a camp fire was burning on autumn nights," because others will just think she is weird if they happen to realise that it was a quotation from *Toldi*, by János Arany. Her soul or memories jut simply do not mean position. And then, we still have not touched upon the incommunicable contents, which define the individual – at least for him or herself – but which are socially irrelevant.

The more sensitive the pick-off device is, the more delicate differences it will recognise in the status system, that is, the higher its level of **resolution** will be. What is under this level simply does not exist, and vice versa, the actors **will regard something as elementary if they cannot perceive its further differences**. (This is the criterion of the perceivability and non-divisibility of elements.)

The resolution of the status takes place in the qualitative or conceptual constituents of the status, given that the quantitative apprehension of resolution is objectively impossible for the

actors many times. I may have a conception about that it is more elegant to live at the Spanish Stairs in Rome or in Rózsadomb, Budapest, than in Kispest or Kőbánya (two outer districts of Budapest, trans.), I cannot express this in terms of quantity. No one can tell why a perfect Van Gogh forgery is much cheaper than the original. Alternatively, what kind of quantitative difference exists between a quilted coat and a mink, when they warm one to the same extent? I do not know what the difference is between a group captain at the air force and a police officer of the same rank, or between an ambulance doctor and a clinical doctor. Why is it reputable to study atomic physics while undignified to work as a meteorologist, while meteorology is probably a much more difficult study?

That the above mentioned oppositions are assigned different prices and incomes – usually different amounts of money – does not expresses the quantitative side of the status, only popular opinion, the prestige, and the resulting potential for self advancement. The most disturbing limit of social research is exactly that in the sea of impalpable social qualities the corresponding quantities, which could be reconstructed by anyone and any time, are missing, theoretically and practically as well. In addition, this cannot be helped by statistics even principally, because **it can calculate merely the frequencies, which do not say anything regarding the quality**.

Thus, the **conceptual resolution** of the status is an unavoidable must in social research and in measuring, because we can **name** such small status differences conceptually which we cannot **measure**. We can make a distinction between two physically identical materials regarding which one is in fashion now, and which one is not; or between two architecturally identical flats within the same building regarding which one represents a socially higher prestige – so being more expensive as well – just because it is a little further from the garbage disposer.

At this point I have to refer in advance to the **seventh** and **ninth** axiom, as these are in close connection with the prescriptions of the here explicated **fourth** axiom regarding the circumscribed content, which – if met – provides concrete meaning to the elementary constituents.

v. The idealisation of constituents

The concept of status is naturally rather idealised. It is primarily so because it is very rigid in time, as opposed to the ever changing nature of the real statuses. In the theory of stratification the status is explicitly used to represent the invariant relationships of the individuals and society. Mobility may loosen up this a little but cannot change it fundamentally. For me the status is much more ephemeral: if a stage-player cooks for himself, he becomes a cook, when he drives, he is a driver, if he founds a limited partnership for managing himself, he becomes an accountant and businessman, etc. For me the invariance does not come from the measuring compromise – that is, from that it is impossible to carry out such a detailed status survey – but from that invariance can be deduced from an ever-changing status situation.

It also leads to idealisation that the constituents of status (possessions, knowledge, power) cannot be enumerated in all of their existing forms. We register that someone is a university graduate, but we have no idea whether he is able to nurse his ill father, or repair the washing machine. Is he able to invest his money rationally and profitably, or he is taken in to a trumpery bond, etc. We know about someone that he is an employee at his workplace, but we do not know whether he has sexual power over his boss or whether he is a tyrant at home, etc. We do not know anything about the knowledge on the basis of which his lifestyle could be

measured. We have no idea about how the value system of individuals upvalue or devaluate the knowledge, power, possessions, they hold. We do not know where the definite border is between the social psychology of status, and its factual, accurate sociological validity. These all lead to that the actual status of an individual is either under- or overestimated. We could enumerate endlessly the deficiencies, which provide the substance of idealisation, and make it necessary at the same time to establish the criterion of the exponent approximation. **Sociology is standing at the foot of a slope, and is very far away from the top**.

vi. The matching of statues: the exchange

The circumscription of the content of status – after the quantification and constituting are carried out – is fulfilled with the synthesis of the three elements. Namely, the independent factors of possessions, knowledge, and power need to be treated somehow simultaneously in the concept of status, given that every piece of action is accompanied by input and sacrifice. This means that the actors can obtain the status or status element important for them in exchange for some of their **status surplus**. If it was not so there would be no reason for people to live in societies. **The relative status deficit is what makes people to latch on to the stream of social actions**, provided that somebody needs what they have a surplus of. The actor offers possessions, knowledge, or power in exchange for other kinds of possessions, knowledge, or power. Of course, one needs to take care of that while he gains something, his inevitable loss be no more than the original surplus, that is, he should not lose something he needs. The everyday person usually has no trouble with meeting this task, but it is rather difficult to model what he is actually doing. A sufficient illustration for the inability of science is that we still cannot describe perfectly how we breathe.

The knowledge, possessions, power are homogeneous regarding their social significance – **however inhomogeneous they are regarding their origin and nature** – because they are in circulation as means of exchange in the operation of society. **When I have a tooth pulled out, my sociological activity and toothache are totally different, "incompatible", with the knowledge of the dentist and his factual contribution. However, as the dentist needs possessions, knowledge, or power, if I possess any of these, the dental activity, that is, the exchange of the above-mentioned values, may take place between the two of us.**

The process is known since Smith, Marx, Durkheim, etc.: possessions, knowledge, and power are meaningful entities, qualities, which function as homogeneous money in spite of their original inhomogeneity, so their quantity is of cardinal importance for the individuals.

vii. The categories of status

According to the holistic and categorical criterion of cognition, if the social status exists, it is necessarily such that every social object can be subordinated to it. If we begin categorizing the objects of cognition starting from the most specific level, and then we try to merge the groups into larger groups, we will arrive at three categories.

1/ Over the course of the last centuries of history several societies became known. A superficial overview of these makes it evident that there are characteristics of every society, which can be found in animal societies as well. Every society is in an intensive relationship with its natural environment, that is, subjects the environment to such procedures, which would not take place on the basis of natural laws. The procedures result in **possessions**, that

is, in parts of the natural environment, which have assigned meanings. The relationship has three main forms: consumption, production, and knowledge.[17]

2/ **Knowledge** has a significant role, as it is a precondition of assigning meanings, so in a way it anticipates the human connection with nature. Therefore, knowledge can be taken out from the circle of possessions. As long as there is no knowledge, no meaning can be attributed to objects, so the relationship with nature can be on the level of animals at the utmost.

3/ Other people are also part of the natural environment of man. The relationship between two people can result in possessions or knowledge, but the qualitative difference between animate and inanimate objects and humans is necessarily present in human relationships as well, making the interaction even more complex. This is the reason for that every known society has applied special methods in order to handle human relationships meaningfully. These methods together can be called the exercise of authority, or, shortly, **power**. Obtaining possessions and exercising power both assume knowledge; but the essential extension of the latter follows its self-movement as well, so it is not mere practicality. This is why knowledge, the third constituent of the status, can be regarded as the fundament of society as well.
The comparison of individuals based on the above three categories produces a rather wide range of differences according to experience. Moreover, they show too numerous and too chaotic differences. One of the tasks of sociology would be exactly to reduce the differences to essential traits, and interpret them theoretically.

To sum up, **what I state is that the status is made up of three categories – P, K, A – each of which has an infinite number of elements; practically they embrace every sociologically perceivable object and phenomenon**. Therefore, the status is holistic and categorical at the same time.

viii. The synthesis of the elements of the status

The quantities of the three constituted elements are homogeneous, because all three come about on the same level of resolution (the conceptual resolution of status), and the quantities obtained for the unknowns are the solutions of linear equation systems. The three constituted elements determine a coordinate. Its distance from the origin is the **status**.

ix. The constituting of the status

The conceptual resolution of the status is a necessary but not sufficient condition of the **circumscribed content of the status**. In order to create an element of the status, the conceptual resolution of a **category** is also necessary, as well as the distribution of the individuals according to the conceptual resolution of the status and the category.

Over the course of the quantification, the researcher assigns frequencies to the meanings he considers to be right. Then, he attempts **to create the elementary social fact** in the form of a cross table, which contains two arbitrarily produced variables: one expresses the resolution of statuses conceptually, and the other measures a status category – for example power – also in arbitrary terms. The resulting **matrix A** is regarded as the coefficients of an equation system, and the following step is to solve this equation system. The final result is **a constituted element of the P+K+A = S system**.

[17] Marx: *Introduction to a critique of political economy.*

This way it can be decided about two constituting based on two different conceptual resolutions whether they are equal or not. The constituting of two variables is equal if the two vectors containing the constituting numbers are equal from element to element. For example, if two constituting of the income are not equal, it can be examined how the error depends on the conceptual resolution, and on the elements, which are classified under the concepts. The computer makes it possible to change the conceptual resolution or the classification, possibly both, from individual to individual. This way it becomes quantitatively explicit **in which data and concepts two different constituting differ; moreover it can be mooted which the right method would be, and competing empirical positions can be formed**.

The explication of the circumscribed content of status is completed with the solution of the equation system made up of the status and the category, that is, with the constituting of the status and category. **Thus, the circumscribed content is an equation system solved with the help of the frequency matrix constituted on two conceptual categorizations of the individuals**. **As we differentiate between three categories, the circumscribed content of the status is the sum of three constituting.**

x. The approximating nature of the status

Of course, the resolution levels can differ in subtlety and content to a large extent, and this creates a basic epistemological barrier in front of bringing the status system to a common denominator.[18] Solving this problem in one step is impossible, as there is so much uncertainty, doubt, inconsistency, indefinability in communication; so, in the end every set of statuses will be arbitrary and erroneous. Still, it has little effect, whether a researcher finds the only one right and objective equivalence system of the different resolutions. The essential thing is that **the sorting of the resolutions should be reproducible for anyone, that is, in case of two different resolutions it should be possible to tell which classifications caused the difference. (This is the computability of the errors and the improvement.)** So, to a first approximation one should not look for the common traits or the rightness of our ways of thinking, but what the reason behind the differences is. Among other reasons the statistical approach is faulty also because such an error selection is made impossible, given that **from the aspect of statistics there is no right or wrong**, or rather, every piece of data takes its share from the error.

In 1992 I defined the possessions of the surveyed by their income. I determined the power position of the individuals with the manager position they occupied in the system of the division of labour. I attempted to measure the level of knowledge via the accomplished level of education.

Obviously neither approach is perfect, rather, they could be said to be primitive. However, my limited possibilities allowed me to select only the most important, and the most easily measurable objects out of the PKA objects, which otherwise have a much wider sphere of operation. Nevertheless, it is not likely that my results would be contradictory to the actual situation based on the meanings I chose. Rather, the thing is that if one wants to measure the drift velocity of a river, it is not necessary to examine the whole mass of water; it is enough to consider the floating billets. That is, the measuring results can be refined to a large extent, and

[18] P. Bourdieau: “L’Opinion publique n’exeste pas.” Les Temps Modernes, January, 1973. pp 1292-1309.

the tendency will not really change. In the present state of research I do not wish to use the measuring results for anything else, but to demonstrate, how the status can be created.

The consequences of the status

Let the 0-1 interval of real numbers be the range and domain of a function. With the help of function **h**, exactly one distance can be assigned to each element of the domain, which shows how far a given point of function **h** is from axis **X**. Of course, this theoretically given function is empty at the moment. Our goal is to find an experiential function that matches the above specifications. The measuring instructions and problems were dealt with in chapter 1. After the measuring is carried out, function **h** is constructed in the following steps.

The result of the constituting

Social status in 1992, the **Σ** matrix:

	P	K	A	Distance from the origin
Elite	-1,9759	4,2730	0,0956	4,7087
White collar	1,3361	13,2272	-43,0099	45,0177
Blue collar	27,0096	-15,5291	50,0902	58,9890
Agricultural workers	-48,2518	2,9767	-5,8392	48,6949

Source: The data of MHB (Hungarian Credit Bank) revised

The table shows the constituting amounts of the status according to the four status groups and the three status categories (P,K,A). If in another analysis the "Agricultural workers" group is not described by vector

$$\mathbf{p} = [-48; 3; -6]$$

the two analyses are not compatible regarding agricultural workers. **Two investigations are compatible if, on condition that the status and categorisation are identical, the constituting vectors are identical.**

Analysing the data, one must realise that there are several ways to proceed:

-The P,K,A numbers constituting the status groups can be considered to be coordinates;
-The basic statuses can be assigned frequencies.

At this point, however, it makes more sense to choose the first method, as it would require lengthy essential and mathematical discussions to realise that the above-defined status – which is the distance from the origin – can be constituted in different ways, depending on the elements of the status. Namely, if the PKA coordinates belonging to the same distance are permutated, essentially three different PKA composition strata belong to one status. This means that seemingly absolutely different strata have the same status, because the low power status is compensated by high income in the distance, or vice versa. This could lead the readers to endless disputes.

The coordinates of status groups (strata) and the status volume

If the aim of the analysis is to examine the social status on the most complex, that is, the most abstract level, it is enough to analyse matrix **Σ**. **Status** is a word that has several meanings. On this general level, under status we mean the **state** of society. This is necessary because in the

social thermodynamics to be explicated later one of the state indicators is the **social volume**, which can be calculated based on matrix **Σ**. As the constituting amounts are the solutions of linear equation systems, the lines of matrix **Σ** are vectors, which determine certain points of the status space. If the points are known, the **distance of two status groups** (of course, **the origin of the status space** can symbolise a stratum as well) can be defined:

$$d = \sqrt{(x_i - x_j)^2 + (y_i - y_j)^2 + (z_i - z_j)^2}$$

Definition: If a human phenomenon can be constituted mutually unambiguously by real numbers, it has a zero point, which can be substantially defined, and (at least theoretically) it expresses a comparison of two individuals or social groups, we talk about **social distance**.

Examples:

the average price of shares (this is the distance between the person holding no shares, and the person holding shares of X value);
election participation (this is the distance between the district where zero participation was registered, and the district where participation was X);
the wealth or income, in terms of money (this is the distance between people with no income (possessions) and people with X income (possessions)) etc.

For example, the number of people in a group cannot be considered as social distance without other restrictions, as it does not express a comparison in itself. If we want to compare the social distances as well, we have to introduce further restrictions. Such are the three criteria of Euclid's distance: positiveness, symmetry, and the triangle inequality.

As a result of the constituting of the strata, we get their coordinates. With the help of these, the distance of the strata from the origin and from each other can be calculated.

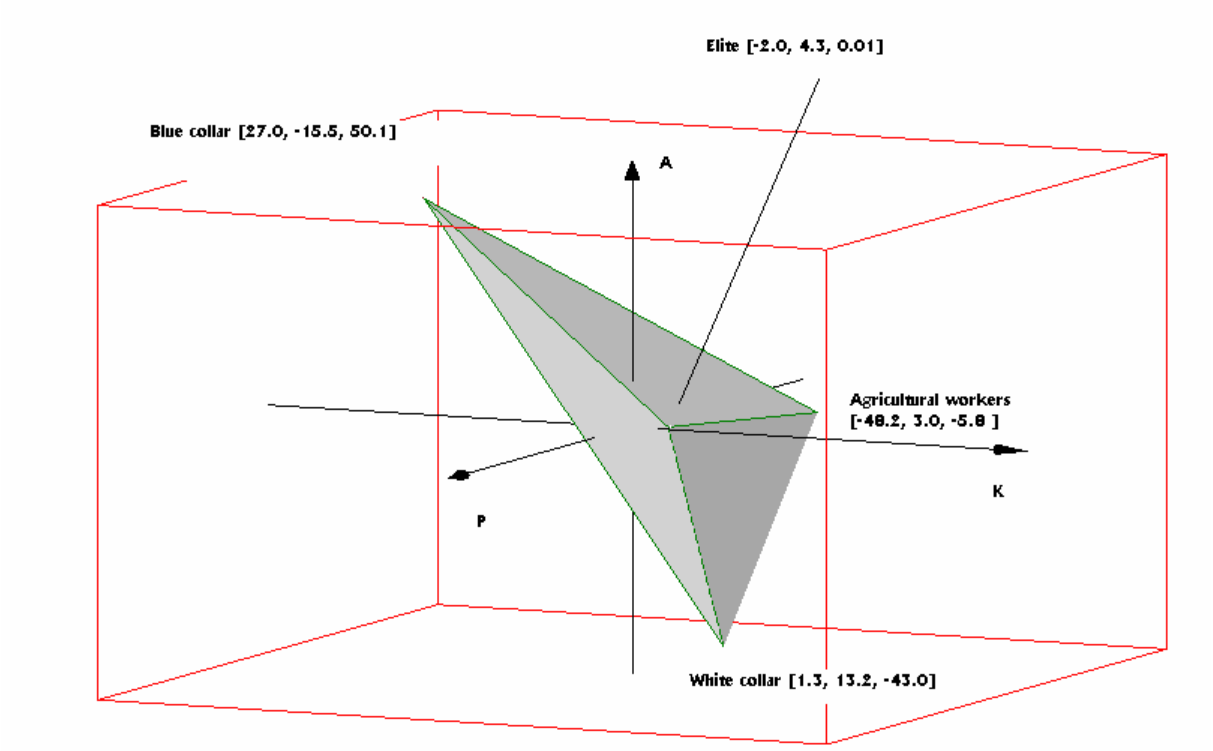
Stratum	Distance
A0	5
AB	44
B0	45
AD	47
D0	49
C0	59
AC	61
BD	63
CD	96
BC	101

The table contains every distance of the 1992 stratification. Each distance is positive, symmetric, and the triangle inequality is true for any three of them.

Definition: The constituted distance of the strata from the origin is called **status**. (Vector of position)

The stratum is the verbal-conceptual denotation of the group; the status is its quantitative description in the PKA system. As the stratum is a social group, the status is held by several people. The individuals within one stratum are equivalent.

The distance is a straight section, which connects two points of the status space. If the sections are continuous, that is, if the endpoint of any section is the starting point of another section, we get a linear figure. **The figure corresponding to the three status categories is the tetrahedron.**



The volume of the tetrahedron expressed by the coordinates of the vertexes is:

$$\pm V = \frac{1}{6}\begin{vmatrix} p_1 k_1 a_1 1 \\ p_2 k_2 a_2 1 \\ p_3 k_3 a_3 1 \\ p_4 k_4 a_4 1 \end{vmatrix} = 3758.0578 volumeunit$$

Source: the same

2.2. The acceleration of social processes: free fall in society

Several kinds of social processes are known, and there are many kinds of approaches to them. For the sake of clarity it needs to be defined what we mean under social process.

Definition: **The social process is a mass phenomenon, in which a large number of individuals participate independently from each other in order to reach a certain goal, and the participation takes place so that it alters in time.**

If we are able to measure the temporal and social space coordinates of a given social change at the same time, then it is possible to graph the route-time type diagram, which is the foundation of physical mechanics. If the **second derivative** of these route-time type functions can be calculated, then we get **the acceleration of the given social process**.

Let us say that the vaccination of the population against smallpox (see USA, September-October 2002) is a social process, as the defined **goal** is getting the vaccination; it is a **mass phenomenon**, as 260 million people have to be vaccinated; and the people **themselves decide** where and when they are going to resort to the vaccination. Obviously, the process will last more than a minute, an hour, or a day – at least for **months** or even **year**s.

The above definition is, however, a strongly idealized statement, as it is almost never fulfilled if rigidly considered. For example, it is possible that in a family one person decides about the participation of the family members, and then they go together to the doctor, and get the vaccination at the same time.

Definition: In case a social mass phenomenon absolutely qualifies as social process, we talk about **social free fall**.

Under this term I mean a process basically insusceptible to influence, which has certain stable attributes. Drawing a parallel to the physical free fall can be revealing. This is also an idealization, as it disregards the agent, the air, as well as the mass of the object, and the height from where the object is dropped. That is so, because these play a negligible part in the process of free fall among normal circumstances on the Earth. However, it is easy to see that in water a pebble stone sinks in a different way than as it falls in the air.

Social free fall is similarly influenced by the environment. Moreover, the abstract character of the process causes an additional problem; namely, that it is hard to tell whether we deal with **free fall** at all, or with a different kind of acceleration. Thus, when I examine the rules of social processes, my goal is to demonstrate: **there is** an acceleration value among the others, which is constant within a given society, independently from the type of the process. Namely, I have observed that the social statuses are set to their place by a force, which gets weaker as it diverges from the centre of the PKA system. This force is the gravitational force that exists between individuals. The consequence of this force is acceleration **g**, which must be constant, as it is the result of the mass of individuals. I have an observation regarding that **g** is constant regardless of even the society, given that the society is a mass society. This suggests the assumption that the radius R and mass M of societies are not independent from each other, but they are in direct proportion to each other. This could explain that in spite of the relationship:

$$g = \frac{GM}{R^2}$$

g is constant. (In the case of Hungarian data, of course, this assumption is unnecessary; unlike in case of using the data of the Dow Jones index, for example.)

As I cannot carry out experiments (such as the slope and free fall experiments of Galileo), I cannot demonstrate directly that this acceleration exists. What I can do is to calculate the acceleration in several different kinds of instances, supposing that it was caused by gravity. In the course of the calculations, sometimes I directly use the formulas related to free fall, and sometimes I conclude indirectly from the interpretation of the model that the acceleration is

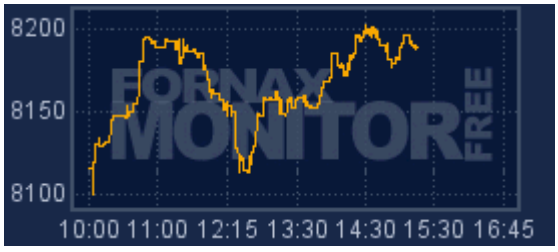
the acceleration of the free fall. In some cases both methods can be used. The only drawback of this is that I can say nothing regarding the circumstances of the applied train of thought, and regarding the clarity of the examined phenomenon, that is, whether or not there are disturbing factors, which could alter the results. For example, we will see that the **g** value calculated on the basis of the same model is sometimes equal to the constant, and sometimes it is not. This is the result of that I have only the observations, and not the experiments. I believe, only statistics can be for our help here: if the values calculated on the assumption of free fall give the expected constant in the statistically significant majority of cases, it is a proof for that the constant exists.

The social processes are functions from a mathematical point of view; their domain is time, and their range is usually the number of people or the proportion of the number of people. The graph of social processes – these functions are usually available in the form of graphs – contains two already construed basic measurements: time and distance; as, for example, the natural numbers describing the number of already vaccinated people are elements of the real numbers. Even when dealing with a large number of people, we find natural numbers or real numbers in the range of functions, which directly fit the numerical line, so they can be understood as distance.

Time-distance functions, however, are route-time functions, so the first and second derivative – velocity and acceleration – known from mechanics can be defined on them as well. Thus, the value of acceleration depends only on the method of function fitting used and the attributes of the functions.

The mass processes of the stock exchange

Based on the data of the BUX (Budapest Stock Exchange) index, in the following I will show the acceleration caused by the daily fluctuation of the index. The range is not the number of people here, but the average price, which was expressed by natural numbers.



The section of the BUX index on June 3, 2002, from10:00 a.m. to 12:29 p.m. – disregarding the accidental noise – looks like one-half of a sine wave. (The scaling of the figure is 0.01 mm = 1.7769 sec. This is important because the two axes must be converted into the same scaling.) As the function is time-digression type, I attempted to apply onto it a one-dimension wave with the formula:

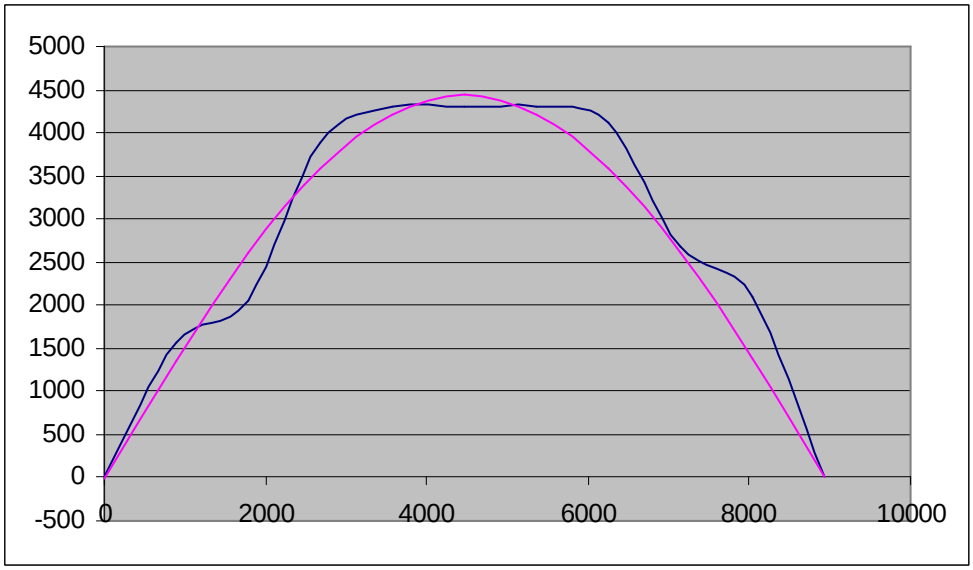
$$K = A\sin(at + \phi)$$

where:

T = 17876 sec; t = 4469
K = digression
A = the maximum of the digression = 4437

ω = the circle frequency $w = \frac{2\pi}{T} = 0.000351$
ϕ = original phase angle (rad) = 0

The result of the application: the two curves show a strong, 95 percent regression.



Source: A jó tőzsde.xls

The second derivative of K is:

$$K''' = -0.000546 * \sin(0.000351 * t)$$

This has a maximum when t = T/4. Then:

g = -0.00054

We get the same result if we use that:

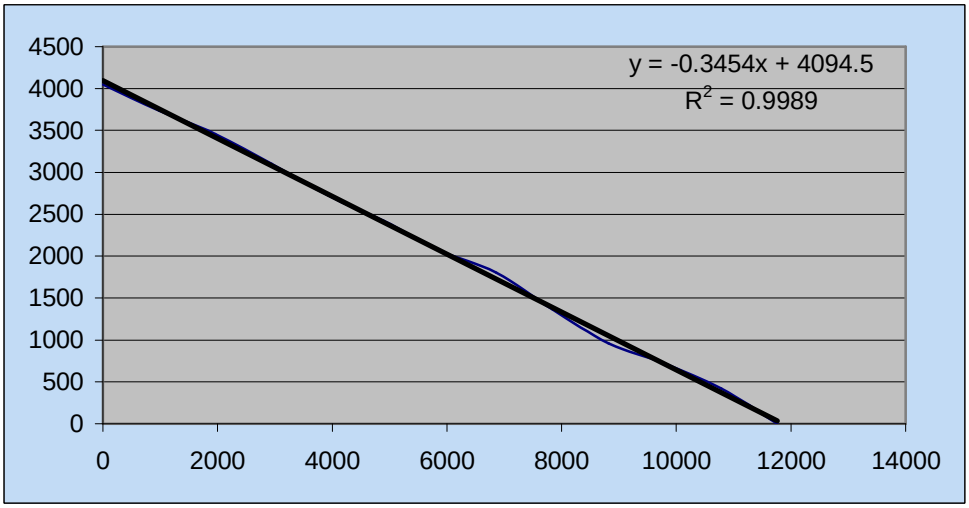
g = Aω^2

g = 0.0005 m/sec^2

In the following case I will establish that we can get the **g = constant** also if we proceed directly from the formula regarding the free fall.

The BUX index on June 25, 2002

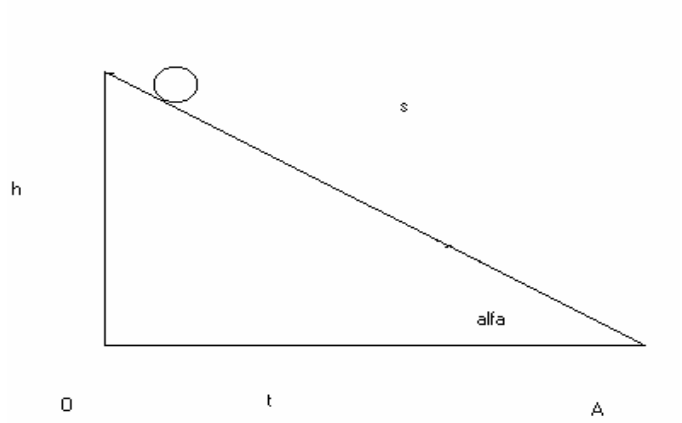
It can be seen on the figure that the value of the index was almost constantly declining all day with smaller or bigger fluctuation. If a line is applied to the data, the result is the following:



On the horizontal axis not the whole interval is indicated, only the section where the line could be fairly well applied to the change of the index: this is the period from 10:15 a.m. to 4:00 p.m. The x-axis shows this interval in hundredth millimetres (1 mm/100 = 1.89 sec) If we consider the alteration of the BUX index to be a route-time process, then the BUX index "released" from the height of 4050 mm/100 on the y-axis "rolled down" on the line

$$s = -0.3454x+4094.5$$

as on a slope. Let h denote the starting height; then the upper diagram is an h-time type route-time diagram. Let the profile of the examined slope be the following rectangular triangle:



The height of **AOB** rectangular triangle is **h** (**h** = 4050 m, because I want to get the value of g in m/sec^2), and **s** is its hypotenuse. Let us release a ball on the slope at the moment t_0! The acceleration of the ball is:

$$g = \frac{2s}{\sin\alpha * t^2}$$

where:
sin h / s the gradient of the slope = 0.1920;
t = a the period of the rolling = 20,700 sec

Side **s** from the formula can be calculated with the help of the Pythagoras theorem from the known values of h and t, and sine α is h/s. Thus:

g = 0.0005 m/sec^2

The sociological pendulum: the acceleration of the changes in public opinion. The dimension analysis of physical pendulum motion: The conformity invariant

The time-deflection equation of the pendulum is rather difficult. Thus, instead of that, the following approximation is used in applied physics, which is 1% accurate up to a 70º deflection:

$$T = \left[1 + \frac{\varphi_0^2}{16}\right] 2\pi\sqrt{\frac{l}{g}} \quad (**)$$

where:
T = the oscillation period;
φ_0 = the largest deflection;
l = the length of the pendulum;
g = gravitational acceleration

When performing dimension analysis on these factors, we get the following quadratic product:

$$B = \frac{l}{T^2 g}$$

Substituting the data of any (45º deflection) physical pendulum, B remains constant, and its value is (**T** = 2.083 sec; **l** = 1 m; **g** = 9.8066): 0.02350. Therefore, the sociological pendulum model can be applied if it leaves the value of B constant.[19]

The production of the isomorphic factors of the sociological pendulum: the examination of public opinion

Napló (Diary), the Sunday evening programme of tv2, a Hungarian commercial channel, regularly has its public vote on different questions. The poll begins on Thursday evenings starting form 0-0: here the numbers stand for the ratio of the **Yes** and **No** answers expressed in percentages. The poll continues even during the programme, and the distribution of the opinions is presented from time to time. The programme used to last for one hour, now for 1.5 hours.

It is noticeable in some cases that the direction of the opinion ratio changes during the programme. Let one series of the ratio of **Yes** and **No** answers be the following:

25/75, 24/76, 23/77;

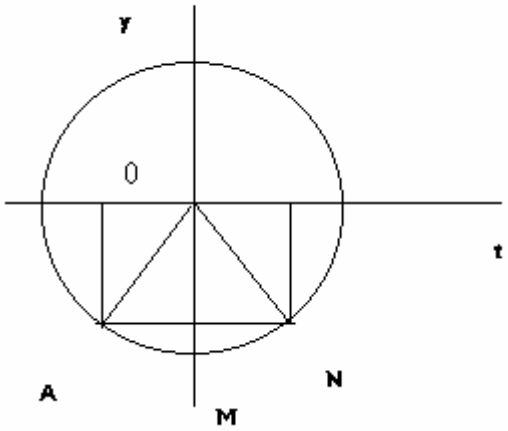
and let it go on like this:

24/76, 33/67, 35/65, etc.

It is noticeable that the highest **No** percentage was 77%, then it started to decrease, while naturally the ratio of **Yes** answers started to increase. The evident analogy for this kind of motion is the pendulum, which, released from one of its furthest positions **A,** swings over through points **B, C, D, F…N** (where **N** is the other furthest point), then it goes through points **…F, D, C, B** in an inverse order, and reaches its original position in point **A**.

Several correspondences can be produced for the above two series. Out of these I have chosen to produce the **Yes/No** quotient, than its arcus tangent. As a result I got such a one-to-one matching, which orders an angle to the ratio of the **Yes** and **No** answers. **I regarded this angle as the deflection angle of the sociological pendulum.** The tangent function alters between 0º and 90º. (The value belonging to 90º is not defined, but it can be arbitrarily approximated.) This means that the changes in the ratio of **Yes** and **No** answers can be described in terms of a pendulum with extreme points that close a 90º angle. In this case the deflection of the pendulum is $\varphi_0 = 45°$.

[19] The verification of the similarity between the sociological and the physical pendulum. **I calculated averages in order to avoid measuring errors. The similarity invariant calculated with the help these averages is 0.02417, which means a 3% error compared to the value calculated from the factors of the physical pendulum.**



Let us regard the pendulum of public opinion to be a mathematical pendulum! Let the suspension point be point **O**, which fits an arbitrary perpendicular line. Let us measure the 45° to both sides of the perpendicular line downwards. We get two half lines, and if we measure onto them the arbitrary length of the pendulum, we get points **A** and **N**, that is, the two furthest points of the mathematical pendulum. If connected, these points produce triangle **AON**, the **AN** side of which is bisected by the perpendicular line that fits to point **O**. Let **M** denote the midpoint! Thus, angle **AON** is 90º, while angle **MON** is 45°, due to the definition. Consequently, angle **AOM** is 45° as well, and triangle **AON** is split into two isosceles rectangular triangles. Of course, also the circle with radius **AO** = **AN** = **R** can be drawn between points **A** and **N**: the pendulum following the changes of the public opinion moves on its circumference. We consider point **A** to be the release point, from where the pendulum swings to point **N**, and then returns to point **A**. This route is the period, and the time the pendulum needs to cover this distance is **T**.
In practice, of course, nothing ensures that we will be presented the pendulum right at the time when it leaves point **A**, or reaches point **N**. Usually we meet the pendulum somewhere along the curve **AN**, and sometimes we register its movement from point **A** to point **N** or vice versa. If we are lucky, we can see it stop and swing over into the other direction. It is also arbitrary how often we are presented its motion. However, these gaps have no significance, as every piece of information consists of two data: the deflection (**φ**) of the pendulum at a given point in time (**t**).

If we consider the line passing through the origin and parallel to the **AN** side of triangle **AON** to be the time axis, and perpendicular **OM** to be axis y, then the equation of arc **AN** will be a quadratic equation:

$$t^2 + y^2 = r^2$$

At the same time:

$$tg\varphi = \frac{t}{y}$$

So:

$$t^2 + \frac{t}{tg\varphi} = r^2$$

From here it can be seen that φ is the quadratic function of time. As I measured the time belonging to each declination, it became possible to apply a quadratic function to the time-declination data with considerable accuracy. (The declination is measured not in degrees but in radians!) Of course, every poll will translate into a different function. This is the reason – beside that we want to calculate the period time as well – for that the function has to be transformed.

Let us shift triangle **AON** along the time axis, so that the vertex of the triangle be in the origin! This does not change the pendulum itself, but it does change the function. Based on the first adaptation, let us calculate the period after (or before) which the pendulum was in point **M** which is in accordance with the 45° declination! (The angle and the time were measured from section **OM** towards point **M**.) If this time was positive – that is, if it passed the 0 point of the canonical coordinate system – let us subtract the duration from the time coordinates of the adaptation function; in the opposite case let us add them up!

Let us carry out the adaptation with the new data! Solving the new equation for 0 we get how much time after passing through point M the arc of the pendulum intersected the time axis. Shortly: we get the quarter of the period time. However, it is also clear from the geometry of the figure that:

$$T = l\sqrt{8}$$

That is, knowing the length of the oscillation period, the length of the pendulum can be unambiguously determined, as the rectangular triangle **MON** is an isosceles triangle. Now every quantity in the formula of the physical pendulum is provided, except for **g**. This can be calculated in two ways.

Determining acceleration

The time-declination function converted into polar coordinates makes it possible for me to assume the following hypothesis[20]:

$$\frac{l\ddot{\varphi}}{\sin\varphi} = -g$$

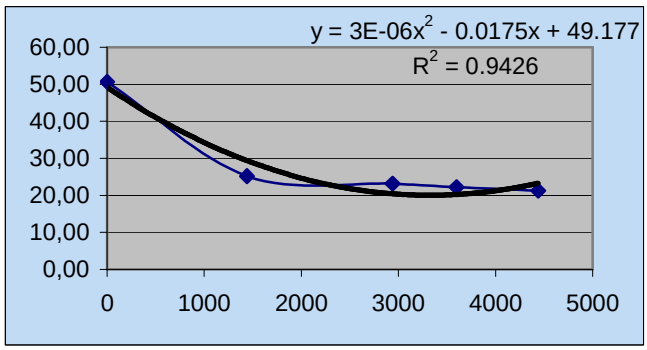
That is, I assume that the acceleration of the pendulum was caused by some kind of force. In the expression only the value of acceleration is unknown, the other data are either results of measuring or deducted from them.
Let us look at an example, which demonstrates the process!

[20] Ágoston Budó: *Mechanika*. *(Mechanics)* Tankönyvkiadó, Budapest, 1991. p99

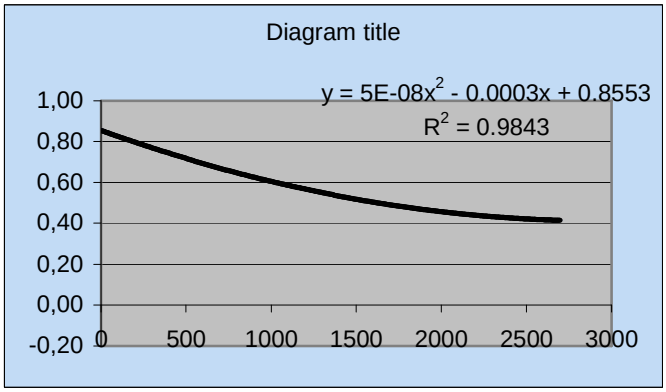
Do you think that the mayor of the 3rd district wants to ban the official participation of homosexuals at the Hajógyári Island (a yearly festival in Budapest) for the sake of his own popularity? tv2, July 15, 2001

Point in time	Time sec	Yes	No	Angle
18:33	0	55	45	50.7
18:57	1440	32	68	25.2
19:22	2940	30	70	23.2
19:33	3600	29	71	22.2
19:47	4440	28	72	21.3

The following function can be adapted to the data:



I converted the rectangular coordinates into polar coordinates, and based on the new equation I carried out a new adaptation:



I derived the resulting function:

$$\ddot{\varphi} = 10^{-7}$$

From here, based on the relationship

$$\frac{l\ddot{\varphi}}{\sin\varphi} = -g$$

the result is:

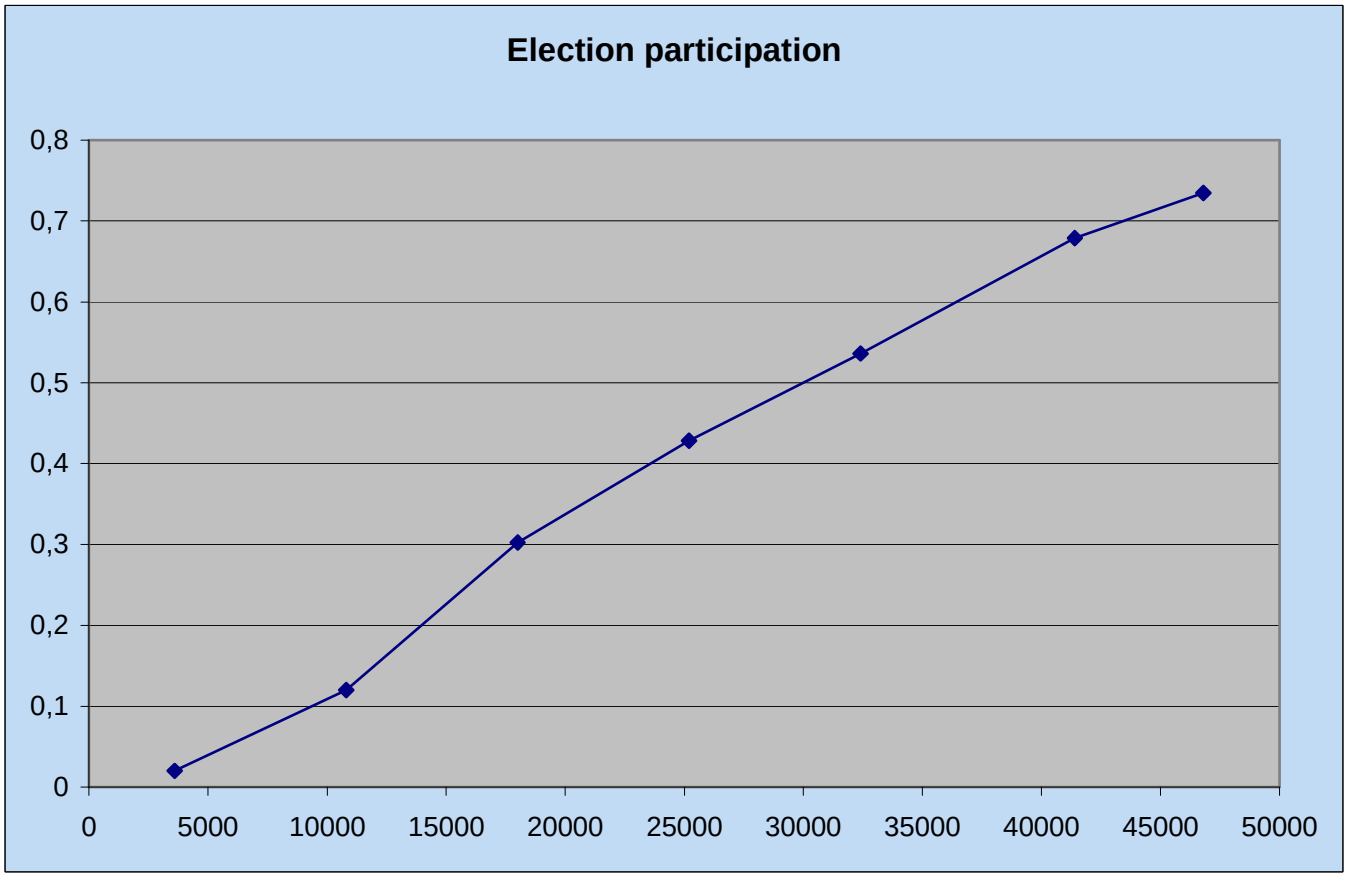
$$\mathbf{g} = 0.0005 \text{ m/sec}^2$$

The acceleration of the election participation

The national election is a mass process. In the following, I will attempt to calculate the acceleration of the election process based on the participation in the 2002 Hungarian elections.[21]

Time: sec	Participation:%
3600	0.02
10800	0.12
18000	0.3027
25200	0.4282
32400	0.5359
41400	0.6787
46800	0.7347

These data, and the function adapted onto them can be graphed:



It can be seen that the graph is nearly straight from 11:00 a.m. to 5:30 p.m., that is, the process can be regarded as constant. If we take out this section in order to calculate the constant

[21] Népszabadság 60/93

gravitational acceleration, then, applying the slope model, h = 3760; s = 23700; sine α = 0.1586.

Then based on:

$$g = \frac{2s}{\sin\alpha * t^2}$$

the result is

g = 0.0005 m/sec^2

The evaluation of the results

Of course, the identity of the four results may be only accidental. As in the case of society at this point it is impossible to experiment with social free fall, I have the opportunity to prove the existence of the gravitational acceleration only by taking a detour.

Let us assume that at the beginnings of mechanics a physicist gets the idea to calculate the acceleration of the most diverse motions. He carries out several measurements, and then he ranges the acceleration values in a table. The question is, what does he experience? The most frequent macro level motion in nature is undoubtedly free fall. Let us remember the raindrops, the snow, the children learning to walk, the leaves, etc. There are many other kinds of motion, of course, but it is obvious that free fall is of a different scale. So, we can assume that the existence of **g** can be established statistically. I have calculated the value of **g** with four different methods, based on several different measurements. The statistical distribution of the data from the 30 measurements I carried out is the following.

I examined the interval of the results between 0.00002 and 0.014737, as these are the values that occurred. I studied how many data fall between 0.00045 and 0.00055. Ten data out of the 30 fell into the interval around 0.0005. Randomly only 0.204 data would fall into this interval. So the frequency of 10 is 49 times more than it could be expected based on chance.

Calculating the correlation also shows that there is no relationship between the random and the measured distribution.

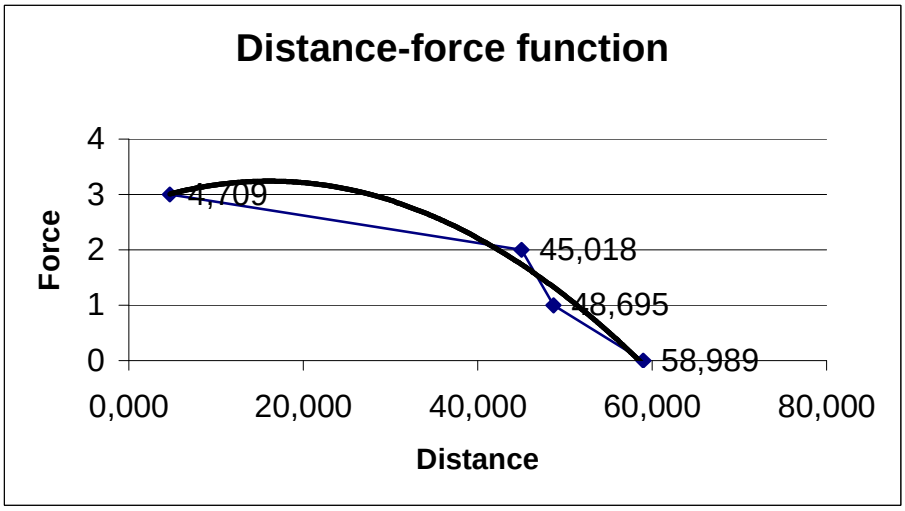
	Coloumn 1	Coloumn 2
Coloumn 1	1	
Coloumn 2	0.173023	1

Of course, the number of cases is very small. Much more data would be needed.

The status work: the potential energy

Individuals are not born with their status, but they get into it. This takes effort, work. Therefore, it is obvious that the snapshot of the status distribution of a given society expresses work.

Definition: if we arrange statuses into decreasing order, the series index $\mathbf{F_T}$ **is called historical force.**



The diagram expresses that in the origin of the stratification there is an attraction centre, which pulls the individuals holding a status, who are equal in this sense. The closer an individual is to the attraction centre, the larger force acts upon him or her. In other words, the force decreases with the distance. As the status is a Euclidian distance, this figure can be regarded as the image of a route-force function, so it is suitable for calculating the area under the function, which will give us the value of work known from mechanics.

Definition: The area under the status-historical force function is called **potential energy**, as it is the sum of the elementary work, which raised the individuals into their status.

$$F = -0.018h^2 + 0.058h + 2.772$$

As we assume that the force, which produces the potential energy, is a gravitational force, we adapt a quadratic function onto our data. If we raise an individual from point P(4.709;4) to point P(0;58.989) – which is the smallest status – through all the transition levels, the work performed is the integral:

$$\int_{4.709}^{58.989} Fh(dh) = W_h = 127.653$$

that is, it expresses the area under the curve. To this we have to add the work, which is needed for rising to the highest status:

127.653+14.127 = 141.78

Thus, the value 14.127 is integration constant.

We get the following results if we carry out the integration for all the four strata:

	Stratum	N	W_i	W_i*N	h	h*N	
	3Elite	245	14.127	3461.115	4.709	1153.642	
	2White collar	188	129.327	24313.476	45.018	8463.335	
	1Agricultural	43	134.974	5803.882	48.695	2093.881	
	0Blue collar	582	141.780	82515.960	58.989	34331.602	
Total potential energy				116094.433			
Average energy				109.730			
Average distance						43.518	
m_0							5042.929

The final result is presented by the above table. In order to raise the whole elite, the elementary work must be multiplied by the number of people in the elite. If we carry out the same operation on the other three strata, and add the work performed for the raising of the four strata, we get the total potential energy. In 1992 the total potential energy for the sample of 1058 is:

E_H: 116094 energy unit

The mass of the individual

As we know the total potential energy, we can calculate the average distance, and with the help of the gravitational acceleration **g** we get the mass of the individual:

W'$_s$ = average potential energy;
h' = average distance;
m_0 = mass of the individual

$$W'_S = m_0 g h'$$

From here:

m_0 = 5043 mass unit

The kinetic conception of social mobility

The status function **h** graphs the result of the status changes of society at a given point in time. This approach quasi freezes social mobility: we do not know where the individuals were just before the given point in time, or where they are heading. This is the approach of **social statics**.

However, society can be – moreover, must be – examined in motion. This is the **kinetic approach of society**, which is possible to develop into **social dynamics**, if we are able to interpret and express the forces, which bring about the motion.

In sociology, the kinetic approach is expressed conventionally in the examination of social mobility. In a wider and rather blurred sense, it would be the task of history to describe society kinetically (dynamically). However, history is rather historiographical at present; it is not a discipline explicating processes of time in a quantitative way. Historiography is a specific mixture of depicting and conceptual thinking, which provides a kind of qualitative description of the displacement of society along the dimension of time, without the appearance of a chemistry type quantitative logic and calculability. It is a basically descriptive, registrative approach, instead of being modelling and explanative. It is a series of the pictorial pageant of events, objects, maps, knowledge, works of art, etc. which, however, are fragmental and disconnected, as they never depict the whole of society, only a selected piece of it. There is a different pageant for numbers, statistics, events, fashions, diplomacy, economy, art, etc. For example, we can gather from several places that the alpaca (luster) coat, the steam engine, nationalism, and the waltz all were in fashion at a formal point in time. We can read from the table of numbers how many the population of the country was at the same time, how much a loaf of bread cost, how many people died of tuberculosis, how many Jews, Reformed, Catholics practiced their religion, etc. But we do not know anything about what is the relationship between the alpaca (luster) coat, the steam-engine, and the waltz, not talking about the connection between nationalism and tuberculosis. Moreover, we have no idea about the stages, which led from the alpaca (luster) coat to the lumber jacket, how tuberculosis developed into AIDS, how shake evolved from waltz, etc. There is a separate history of religion, history of technology, but we have no conception about whether these are running parallel to each other in the same country, or there is a connection between them. That is, we do not know anything about how and along what kind of laws the mostly qualitative and a little quantitative farrago making up a historical age is connected at a given point in time, and mainly, what kind of laws influence its changes. It is **as if time was a huge bulldozer pushing in front of itself the mixed belongings, garbage, concepts, events, beliefs, and hopes of every society**. The present approach to history shows the state of the urban dumping-grounds, where the ever arriving refill is formally spread out by the machines.

I come clean on that I am not able to create the one-concept model of the changes of the inhomogeneous society either, which would provide a description of the necessary inner cross-section of the apparent inhomogeneity, and the laws of transition. However, I have to refer to the pyramid model from the beginning of this study, and to the third axiom, which prescribes the apprehension of the holistic nature of society as an obligatory goal. For there must be an inner order in the social inhomogeneity, and it is certain that one state does not follow the other on an arbitrary basis. **Namely, if neither the inner relationships, nor the whole integrating these relationships is law-governed, it becomes meaningless to talk about any kind of social science, as well as to paint the pageants, and to rummage for the data**. The right method is to seek the comprehension of the whole on a well chosen level of abstraction, and to make the development of the model open to factuality, that is, to leave loose threads and pieces sticking out, which can be connections to the possible next level.

Thus, status change places the diversity included by the PKA triad into the dimension of history or time. Namely, the essence of mobility is not in how much percent of the trained men became skilled workers, or how many of agricultural workers' children became white-collar workers. It is neither to ear the political cross-talk in order to understand how the croppers became collective peasants at first, then farmers; that is, the examination of mobility is not to serve political dreams and self-justification, but it is about the transformation laws of the whole which I apostrophized as historical garbage or deposit. **According to this**

approach, status comprises all these in a so far undifferentiated way, so the change of status provides a somewhat moving, changing framework for the later insertion of concrete elements of status, which would organise the anarchically rolling garbage-heap into a structured set of objects, concepts, and behaviour.

The elementary model of mobility: the change of social distance and volume

If we say that the elements of mobility, as a system, are the individuals, who are regarded as unstructured units, we talk about the **elementary model** of mobility. On this elementary level of approaching the phenomenon, we call a given set of individuals stratum, while society is the integration of the strata (which have no common element). From a definition of society like this it follows that stratification is a classification of a set of individuals (of society), which creates that scope in which mobility can take place.

The change of stratum of the individual is called **unity motion**; that is, the abstraction is performed which assumes that every single individual (simultaneously or sequentially) is in one of the strata of the stratification. This approach allows for that anyone can get into the same stratum recurrently. In the elementary model the course of mobility is regarded as a random process (given that we have no deeper information); that is, the occurrence of the unitary motions (as events) in the stratification is considered to be random. **On the basis of all these, the total social mobility is treated as a mass phenomenon**.

Under the momentum of stratum **A** related to stratum **B** we mean the number (volume) of elementary movements from stratum **A** to stratum **B**. It is denoted by $\mathbf{m_{AB}}$**.** The quantity $\mathbf{m_{AB}}$ is a variable.

In the following part a mathematical method will be provided, which makes it possible to describe the elementary model of mobility so that the description makes it possible also to analyze the distribution of the mobility momentum, $\mathbf{m_{AB}}$.

A/ The combinatorial description of the elementary model of mobility

Let the set corresponding to the given society be $\mathbf{E = [e_1, e_2 \ldots e_n]}$ (set of individuals). Then, a classification of set E will represent a stratification of the given society. That is:

$$\mathbf{E = E_1 \cup E_2 \cup \ldots\ldots\ldots\ldots \cup E_k} \qquad \mathbf{(1)}$$

represents a stratification consisting of **k** strata, if

$$\mathbf{\text{for every } i \neq j \Rightarrow E_i \cap E_j = \varnothing} \qquad \mathbf{(2)}$$

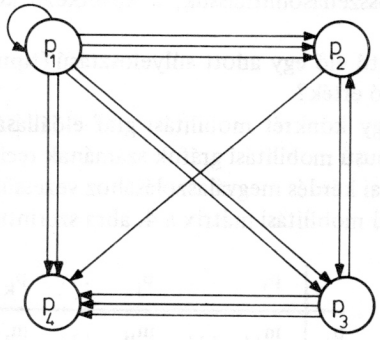
Then the unity motion is placing an element from one of the $\mathbf{E_u}$ classes (u =1,2,…,k) to an $\mathbf{E_v}$ class. It is obvious, that after this operation we get a new classification of set **E**. So if we understand the total mobility between two points in time to be the sum of unity motions, this will mean in the set model that **from the classification of set E we create an other classification of the same set**.

Let us define now the following graph **G = (P, U)**

- The angular point set **P = {P_1 , P_2....., P_k}** of graph **G** is created so that we correspond exactly one P_i angular point to each E_j (i = 1, 2, ….., k) class in the given classification of set **E**.

- The edges of graph **G** represent the "traces" of unity movements, that is, taking the above example, in case of the transfer from stratum E_u to stratum E_v an (P_u P_v) edge is drawn in graph **G** (that is, the edge from angular point P_u to P_v). As an example, let us present such a graph **G**, with the following unity movements during the examined period:

(E_1E_2), (E_1E_3), (E_1E_4), (E_1E_3), (E_1E_2), (E_3E_4), (E_3E_2), (E_1E_4), (E_2E_4), (E_1E_1), (E_2E_3), (E_3E_4), (E_1E_2), (E_3E_4)

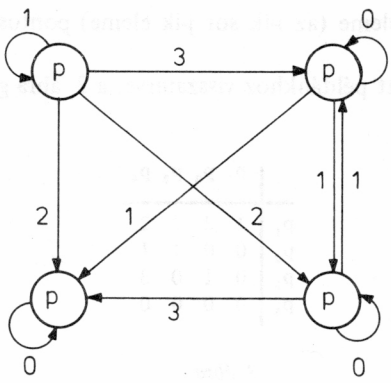


2. ábra

(Figure 1)

On this (the transition from one classification of set **E** to another) basis, the so-constructed graph **G = (P, U)** describes all the mobility in a given interval.

As it is seen from Figure 1, there can be several edges in the same direction (so-called parallel edges) between two angular points, as more unity movements can take place in the same direction between two strata. For the depiction of this a more clear-cut graph can be applied, the so-called weighted edge graph. In this case this means that we assign a number to the edges between each angular point and its neighbour, which signifies how many edges there are in the graph parallel to the given edge. This equals to the number of the transitions (elementary movements) between a given pair of strata in a given direction. If there was no movement between a given pair of strata in the given direction, the weight of the edge is zero. Using this kind of depiction, the graph of figure 1 looks like this:



1. ábra

(Figure 2)

The mobility graph **G** shows expressively the mobility for a given interval of time, but it is not applicable for computer analysis in this form. However, a matrix representation of the graph can be corresponded to each graph, which is produced the following way:

- let us enumerate every angular point of graph **G** in the rows and columns of matrix $\mathbf{M_G}$.

- then, $\mathbf{m_{AB}}$ element of the matrix (the $\mathbf{j^{th}}$ element of row **i**) includes exactly the weight of edge ($\mathbf{P_iP_j}$) of graph **G**. Returning to the above example, the matrix representation of the graph from Figure 1 is shown on Figure 3.

	p_1	p_2	p_3	p_4
p_1	1	3	2	2
p_2	0	0	1	1
p_3	0	1	0	3
p_4	0	0	0	0

3. ábra

(Figure 3)

It is interesting to recognise that **the matrix obtained this way is the matrix known as mobility table**. We expounded the graph model behind this table, so that it becomes palpable that if the strata $\mathbf{p_1, p_2, p_3, p_4}$ in the PKA system correspond to the strata **Elite**, **White-collar** worker, **Agricultural** worker, **Blue-collar** worker (which were also obtained via a linear transformation), **mobility can be conceptualised as the linear transformation of the status system**.

The status system is formed by the linear transformation of vectors:

$$\mathbf{x_P A_P = b_P}$$
$$\mathbf{x_K A_K = b_K}$$
$$\mathbf{x_A A_A = b_A}$$

where the coefficient matrices A_P, A_K, A_A are obtained empirically, and are simultaneous.

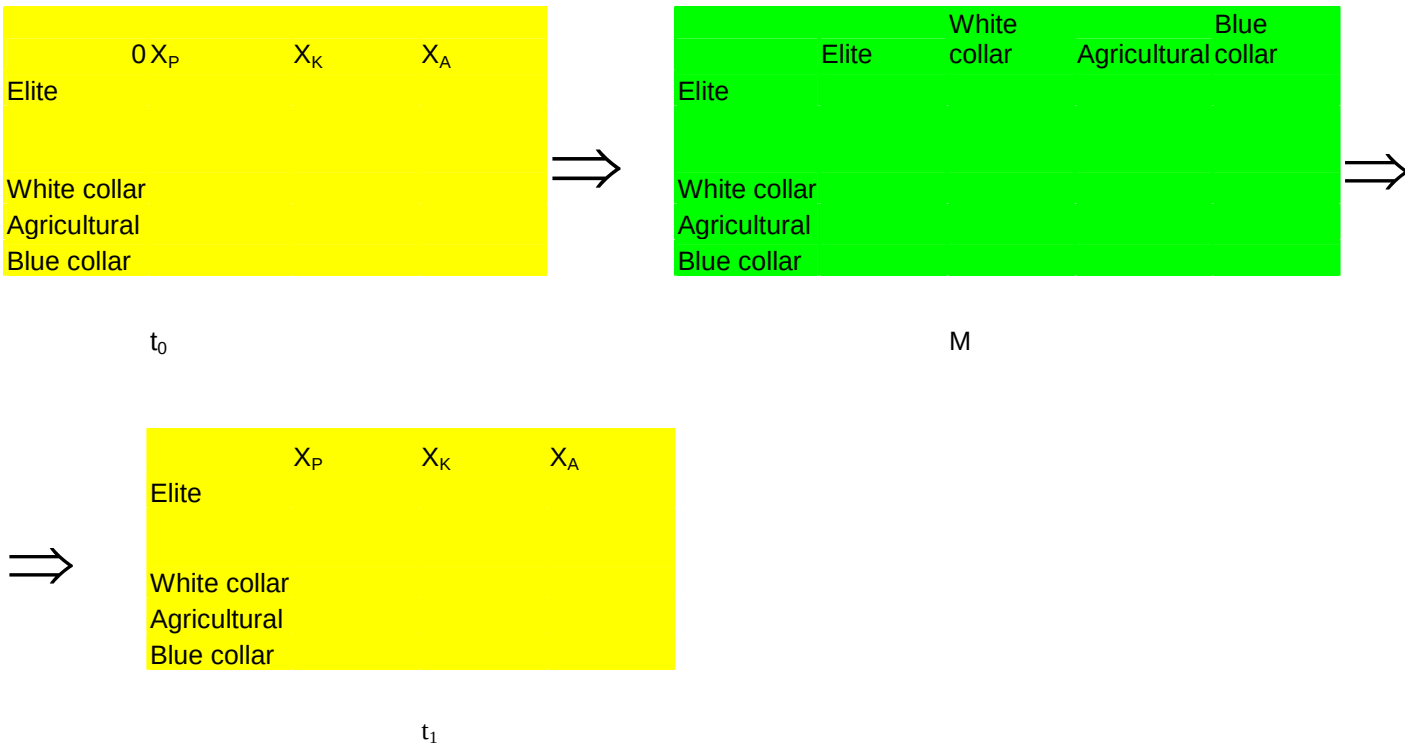
Mobility is described via linear transformations of vectors as well:

$$x_{P_{t_0}} = Mx_{P_{t_1}}$$

$$x_{K_{t_0}} = Mx_{K_{t_1}}$$

$$x_{PW_{t_0}} = Mx_{PW_{t_1}}$$

where we get coefficient matrix **M** empirically, but the original and the image vectors differentiate from each other in time, that is, they are not simultaneous. (See the following figure)



At the end, the difference between the two linear transformations is only that in the case of the forming of the PKA status system the original and the image vectors of the representation are simultaneous, while in the case of mobility a **t** period separates them from each other. Period **t** is expressed in the mobility table **M** (the coefficient matrix of the linear transformation in

time). This also means that mobility is manifested in the change of social distances, as the temporal representation of the vectors of the status system naturally changes the size of the vectors, and so the distance between the points of the PKA system. **At the same time, the change of distances also affects the volume, as the distances constitute the edges of a closed spatial body.**

CHAPTER 3

SOCIAL THERMODYNAMICS

1. Society, as a thermodynamic system

If we examine either stratification or mobility, the present theories are only descriptive. Usually it is not even attempted to say something about the dynamics of social changes; the word dynamics meaning here what it means in mechanics and in physics in general. **Dynamics primarily means the causal explanation of changes**. Secondarily, different sciences choose the devices used for the causal explanation of changes in different ways. In empirical sociology there are only separated attempts for the causal explanation. It is so, because **society is a holistic, communicated, and an extremely complex system**. These features have been discussed at several points of this study.

Starting out from the above-mentioned characteristics, I was looking for an approach for causal explanation, which is general enough to embrace the whole of a holistic society, and which can be applied to any arbitrary level of abstraction at the same time. Namely, due to the heterogeneity and chaotic movement of society it is not useful to look for the casual explanation on a low level of abstraction, because that would make research very limited, and it would lose the holistic nature. An abstraction level, which is too high, on the other hand, would bring about the danger of being solid but meaningless, even in the form of the most factual statement.

Status and the change of status seem to be satisfactory for the role of the medium in a substantial social dynamics, as the **PKA** constituents can be interpreted on the most varied levels of abstraction. For example, I can examine among a group of kindergartners the distribution of toys or food (**P**); I can survey their simple worldview (**K**); and I can analyse the dominance relationships between them (**A)**. I can do the same with primary or secondary schools students, with undergraduate students, with adults of a company or of a region, with a whole country, or with all the population of the world, if I consider the **PKA** constituent in a more and more extensive and complex way. Of course, in this way the sampling and the accessibility of the data will be more and more difficult even merely from an epistemological point of view. It will be a problem that the whole of possessions, knowledge, and power will be taken into account on increasing and more and more mature groups. But, there is no theoretical obstacle in front of such an operation.

At the same time, there is no significant sociological phenomenon, which would not fit into the large set of the **PKA** triad, so the status and its changes seem to be a good medium for the establishment of dynamics.

However, the main question is, where shall we find a model which can handle dynamics. Theoretically, there are two possibilities for this: either it has to be established within sociology, or it has to be adopted from another science. Still, in reality, we have no such choice; in the course of the development of sciences it is a general phenomenon that each new science (or an old science facing a new problem) is enforced to use the already existing – basically inadequate – models of thinking for the navigation on the new field of cognition. It can be seen that this is necessary, as such principles cannot be taken from the unknown field, due to that it is unknown. So, if one does not want to give up the dependability of cognition –

and the possibility of cognition as such – one must turn to already approved models. It often happens that researchers try to solve the new problem via a totally inadequate old way of thinking in their first freight. This may be laughable but it is absolutely necessary. For example, when the phenomena related to the vacuum had to be explained, it was very seriously considered that Nature abhors a vacuum. Even at the beginning of the last century the transmission properties of electromagnetic waves were interpreted with the help of a carrier medium, ether, because only such waves were known which are transferred by a medium. **In sociology, the first steps were of biological or psychological nature, which is tragicomic because neither biology nor psychology was as developed that they could have provided models. And historical materialism tried to establish a whole picture of society from economics**.

We could go on with these examples endlessly, but one more thing, the most essential, has to be mentioned: using mathematics as a model is theoretically nothing else but trying to explain physical phenomena with religious models, for example with the will of the gods. **It is so because reality is not mathematical**, so when we extract the root of the volume of a container, we have to remember that one cannot extract the root of a real container, only of its mathematical model. This is so much true that it is questionable whether every feature of a mathematical model corresponds to something in reality, or only certain elements are analogous with reality. For example, if we write down the universal gas law serving for the description of ideal gases with actual data, there may be prime numbers in it. We still should not think that prime numbers have any physical substance in this relation.

Similarly, **no one can take it seriously that it makes sense to extract the root of a social phenomenon**. Still we are doing that when calculating the standard deviation of the income distribution of a mass. That is, it is rather questionable whether the age of an old man and a baby can be added, not talking about much more abstract mathematical operations. Namely, while two areas can be added also in reality with the uniting of two sites, two lives cannot be united in reality.

The basis for carrying out mathematical operations carelessly in the most varied situations is the faith in that there is isomorphism between the sociological phenomena and the extracted quantitative relationships regarded as essential. However, this is only a matter of faith, an arbitrary assumption, as the reason for our examining mathematical models instead of sociological ones is exactly that the latter are unknown, that is, it cannot be decided whether they are isomorphic or not.

It can be seen in today's cosmogony, in the theory of the Big Bang, what kind of nonsense the hidden differences of mathematics and the modelled reality can bring about. In this theory the beginning of time and space is considered seriously, as it comes from the mathematical model; but it is forgotten that the beginning of something can be defined only in time, that is, the beginning of time is nonsense, just as saying that **I am my father**. Grammatically such a sentence is perfect; but, dear reader, try to think about its meaning.

Still, the inadequate, old models make it possible at least to conceptualise a given problem. When an unknown phenomenon arises, we cannot expect it to be conceived already in the adequate terms. The inadequate models are later put trough a continuous deformation over the course of their comparison with reality. More and more unnecessary or erroneous elements are left behind; different – sometimes seemingly absurd – auxiliary conditions are introduced,

then one day the whole theory is discarded, and exchanged for one which budded from the soil of the phenomenon itself.

The metaphor of budding is not accidental: the development of concepts is very much like the metamorphosis of plants and animals. If we asked a Martian if he recognises **the walnut-tree in a walnut**, or **Einstein in the sperm of Einstein's father**, he would probably say no. At the same time, it is certain that conceptual development and the developments of conceptual systems will never lead to total differentiation, and it is almost impossible to tell, when and to what extent the old and the new differentiate, if they differentiate at all. The process can be compared to the living matter once again: when examining the cell division, I am always amazed by the perplexing interplay of continuity and discontinuity. How is it possible for a cell to divide without its own destruction? Moreover, there is a relatively long period, during which it is not yet divided, but not one whole anymore either; then where is the point when it is divided, and how is it possible at all, when if I am cut into two parts, both parts die? That is, the division is supposed to happen before the cell is actually divided, which is of course a conceptual nonsense; still, this is reality. Going one step further: the divided cells are identical in many of their elements, but they are also different, otherwise they could not grow into different tissues. Thus, division is not a simple duplication; however, if it is so, how the original cell conducting the whole process can pass on properties, which it did not have originally.

If we substitute the word "model" instead of "cell" into the above paragraph, we have described the development of conceptual models as well. Even the most abstract models preserve something from the most primitive thinking, as they must use natural language as well, which is full of animism. Who would think that the mere fact that our statements consist of a subject and a verb is the remaining of the most primitive worldview, basically the personification of nature: that is, the series of the actions of an actor. Let us take, for example, a sentence describing some atom physical phenomenon from a course book:

We get a self-sustaining chain reaction if at least one out of the neutrons stepping out from the fission process brings about a nuclear fission.

Only man is able **to sustain** something. It is only human beings who step out from something; we do not say that an animal stepped out from its cave. The prefix **neu-** means neutrality, that is, neither female nor male characteristics; which also derives from the dualism of man and woman. The word **chain** is obviously a metaphor here: if we did not know chains made of metal, this word would probably not exist. Also, only a human being or a god can **bring about** something.

Of course, these meanings are dimmed during the understanding of the sentence, but they are present, just as personalisation is present in the subject **chain reaction** or in the verb **bring about**. When we comprehend such a sentence, unbelievably rapidly though, but we understand everything in their original meaning at first, and only after that do we conceptualise the abstract picture of colliding atomic nuclei and neutrons. The concept may be absolutely factual, that is, it lacks all animism, but without animism such a statement of facts could not be uttered. So, even if we regard this sentence as the grammatical model of an atomic physical fact, the most ancient animistic model of thinking is indeed present in the sentence, although unimportantly and in a subordinated way. And this has to be so, because

the continuity of the cognitive agent and cognition itself cannot be broken off just because something new was acquired.

The continuity of models is actually the continuity of the cognitive man; otherwise a man, who had known only the four basic operations (the finite algebra) but now has acquired the liminal values and so the calculation with infinity, would become devoid of his past and so of his personality. And this personality – in a wider sense, history – division had to take place every time when a theoretically new model or paradigm was applied by man. Cognition is a little like the old joke: Many things must change so that everything may remain the same. It is necessary because of the inevitable continuity of cognition.

Therefore, the avoidance of inadequacy is not a good strategy for the selection of a model, given that inadequacy is unavoidable. The question is how effective the chosen model is, and this can be decided only afterwards.

So, the arbitrariness axiom of cognition is to be taken very seriously, because if arbitrariness is not allowed, we can discard a significant part of today's scientific knowledge. But what shall we do, if it does not make sense to strive for finding an explanatory model at the very beginning from the very field we are about to explore, and it is a groundless optimism to believe that the adopted models will not lead us into the dark woods? According to the development of sciences only prediction can be a cure.

Thus, it is a matter of taste whether the reader will accept the following model of thermodynamics for first reading or not. Theoretically, it is just as bad or good as any other is. It speaks for this model that it is concerned with energy and its transformations, that is, with the most general properties of movements.

If we do not regard social movements as virtual – and it is difficult to say that the world wars or the oil crisis are virtual, to mention only two examples – there must be an energy, which characterises this field.

The goal of this study is to introduce this energy and the utilisation of thermodynamics.

There have been attempts for the thermodynamic modelling of certain subsystems of society. The motivation behind this is probably that the physicist and the sociologist meet problems of the same nature and complexity. The former faced an unsolvable task in the form of the mechanics of systems having many elementary constituents, for example gases. One mole of gas contains $6*10^{23}$ chaotically moving molecules. Theoretically, it is an impossibility to describe their behaviour with the equations of the Newtonian mechanics. The sociologist is in a little better situation, because he or she should say something about the chaotic behaviour of groups of people with maximum $6*10^{9}$ members; however, no social mechanics exists which could be helpful in this case.

In physics, the solution was provided by that the behaviour of gases, and later of every other physical system, could be delineated in phenomenological thermodynamics with relationships between at least three global quantities. These are – usually – the following:

N: the number of the particles of the system;
E: potential energy;

V: volume.

Also, we can use instead of one of the above quantities temperature, pressure, or entropy. The main thing is that if we know any three of the above listed quantities the missing properties can be calculated from their relationships.

Now, if one would like to explain the behaviour of people in a simple, clear-cut way, it is obvious that the methods of phenomenological thermodynamics should be used. It also encourages us to do so that thermodynamics makes universal statements, that is, it does not matter to what kind of physical system it is applied. Of course, when we change over to sociology, it may be questioned whether the principles of thermodynamics can be extended to society as well. One of the goals of this study is exactly to demonstrate this change-over.

a/ Social entropy

Out of the triads necessary to describe a thermodynamic system we have three already: the number of elements constituting the system (**N**), the volume (**V**), and the total potential energy ($\mathbf{E_H}$). However, a further quantity is missing: entropy.

The following formula is known from statistical mechanics for calculating the number of states in a system[22]:

$$\Omega(E) = \frac{V^N (2\pi m_0)^{\frac{3N}{2}} \frac{3NE^{\frac{3N}{2}-1}}{2} \delta E}{h^{3N} N! \Gamma(\frac{3N}{2} - 1)}$$

Two remarks should be made regarding the formula.

1/ It is applicable for society, if

$$\delta E = h^{3N}$$

So δE is chosen to be equal to the power of Planck's constant (h). We can do that, and given that the latter number is rather small, if we reduce the formula with these, the alteration is negligible. The other quantities in the formula are all defined in sociology.

2/ In the formula there is a function **Γ**. I used the following approximation of this:

$$\Gamma(\frac{3N}{2} + 1) \approx (\frac{3N}{2e})^{\frac{3N}{2}}$$

if **N** is much larger than 1.

b/ The potential energy of society[23]

[22] Károly Nagy: *Termodinamika és statisztikus mechanika. (Thermodynamics and Statistic mechanics)* Tankönyvkiadó, Budapest, 1991. p229

The potential energy of a thermodynamic system is the fourth parameter describing the system. This was defined in the adequate chapter, and also its value was given. As the energy and the volume were defined, the concept of social pressure, social temperature, and social molar weight can be introduced.

c/ The social pressure

$$p = \frac{2E}{3V} = 21 pressureunit$$

d/ The social temperature

$$T = \frac{2E}{3Nk} = 530°K$$

Finally, based on the mole weight used in thermodynamics:

$$M = m_0 N_A$$

I introduce the social mole weight:

$$M = 303718 massunit$$

2. The probation of the model

One of the basic equations of thermodynamics is the following[24]:

$$S = \frac{3Nm_0 R \ln\left[pV^K\right]}{2m_0 N_A}$$

If we substitute our data into this formula, the two sides of the equation will be 3760 and 3668. From this the error is 2.5% in proportion to the smaller value.

As the calculation includes several measuring and estimation errors, the resulting error can be justified. And this is exactly the reason for that we could not expect an accurate result in the first place. **This suggests that the model is right**.

[23] All basic data refer to the 1992 states in Hungary. The data were estimated based on a representative sample of 1058 people.

[24] Károly Baranyi: *A fizikai gondolkodás iskolája. (The School of Physical Thinking)* Volume 2. Akadémiai Kiadó, Budapest, 1992. p55

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APPENDIX A

In order to understand with what sociology is concerned, we need to take a short detour. Let us take an absolutely ordinary situation from the life of a society; one, which happens by the billions all over the world for centuries, and which represents what we call par excellence **social**.

Let us assume that Kovács úr, or Mr Smith, or Herr Schmidt, possibly Nalbant bey wants to have his home painted, and he wants to know how much paint he will need. At this point an **idea** occurs to him: he paints a 1mx1m area, and measures how much paint it requires. Then he is going to measure the height and width of the walls, subtracts the surface area of doors and windows, so he will get the surface area of the walls in his home. If he multiplies this by the unity paint requisite, he will get the necessary amount of paint:

$$F = g(A)$$

Namely, he lines up a function between the weight of the paint and the surface area of the wall, which is obviously an idea. That is, it is not an object: it cannot be seen, heard, touched, or tasted. Yet it is an absolutely ordinary something. The attention must be drawn to that even the most developed science is based on this absolutely ordinary method (of manipulating the environment and creating symbols on the way), as well as other behaviours of certain tits, apes, and other animals as well, obviously the latter ones on a primitive level. Is the above though soft? Let us say yes, because nothing ensures that Kovács úr used the right method: simply, the idea cannot be compared to the room and the paint **directly** in any way. Each propagandist plays on this fact, from the Jehovists, through the Communists, to the Országimázs Központ (Centre for the Country Image, Budapest), including Kovács úr, who is basically lying, either consciously or unconsciously. Thus, the thought, or idea, is already primarily – also intrapersonally – a sociological element, because the thought preceded and provided with existence each palpably existing social object, like a painted room, a motorway, a plough-land, or a medicine, which cannot sensibly be called soft fact.

But let us proceed! The process has been absolutely intrapersonal and thus unverifiable so far. Still it will become clear that the thought must be some kind of objective entity, as for example three painters can argue about it, saying:

A: Where the wall is wet, it will not absorb the paint as much, so the unity amount cannot be just simply multiplied by the surface area of the wall.

B: Yes, it can, because if it is very hot, the wall will go dry. The problem is that in dry weather the amount of paint must be increased, so the multiplier should be increased.

C: This is true, but the amount of paint necessary is also dependent on how experienced the painter is: how much he lets drop, how much is the overlap between two brushstrokes, etc.

And so on, endlessly. That is, they are able to anatomize the thought of Kovács úr in their mind – and what is even more important for sociology, in communication. Also, they can compare it to the actual amount of paint needed. That is, **they are able to divide the thought among the three of them, and compare it to reality. So the thought is a sociological element indirectly as well**. (Of course, the order has no significance here. We could actually

reverse the order, as in practice we meet either the intra- or the interpersonal processes at first. In other words, they assume each other.)

So the thought is just as an objective entity as the wall or the persons themselves, in spite of that the thought remains inaccessible all along the way and it can become insubstantial or empty at any time. It is a little like the old joke when one fool say to the other to sit on the shadow of the chair. “Go to!” says the other. “Then you will turn out the light, and I will fall on the ground!” The thought remains a shadow in the most solid science as well as long as it is not verified by deeds. (The latest failure of American-French researchers in the exploration of Mars, which meant the loss of several hundred millions of dollars, was due to that the French calculate in metres, while the Americans in yards.)

Thus, if we do not doubt the existence of the wall or of people, we cannot doubt the existence of the thought; the only weak point is the adequacy and the extent of its correspondence to reality. However, based on such “erroneous” or “soft” ideas millions of homes have been and are painted. And still, a thought will never appear for us as a chair, a dog, or a star. We will never experience it. However, what we experience is a mystery as well: the carrier of the idea is the language. Furthermore, the statements of facts corresponding to the linguistic symbols can be experienced as well, and the objects which are artificial: houses, bridges, and the different forms of behaviour which follow the thought, for example painting a room, driving a car, singing an opera, etc.

Thus, the subject of sociology is the reconstruction of the objective processes which lead to the verified or confuted thought, then materialise it, process it, and objectify it in the transformation of the environment.

So the subject of sociology is **indirect**, which causes all its difficulties. The thought itself will always remain impalpable.