

Modern science views the experience as the only source for the study of truth. And this is certainly not without reason. Their territory is the realm of outer space objects and temporal processes. How should an object belonging to the outside world can make up anything without him by means of sensory perception, which is the only way to come into contact with spatial-temporal, to have met. Only the object to know (1) and then theorize about it, this is the maxim, which makes modern science to the speculative systems of natural philosophy from the beginning of this century asserted. This principle is well justified, but it has passed through a mistaken conception of science astray. The misunderstanding lies in the character which the inductive method and the current flowing from the same materialism and atomism, the general concepts of contamination. It can be for the discerning no doubt that the present state of science is in its theoretical parts significantly influenced by concepts such as those by Kant become dominant. Do we want to dwell on this relationship, we have to raise him in our consideration. Kant limited the field of knowledge to the experience, because in the same conveyed by sensuous material was the only way to fill in our mental organization lying in totally empty conceptual schemes, the categories. He was sensual content, the only form of such. He had directed the verdict of the world in a different direction. Had you previously thought, the concepts and laws as belonging to the outside world, had been ascribed to them objective validity, they now seemed merely by the nature of the "I" given. The outside world was regarded merely as raw material, but as that which is solely attributable to reality. This position has inherited the inductive science of Kant. Also aware of the material world is considered the only real, with their concepts and laws are justified only insofar as they have for those contents and give the same recognition. About this empire protruding terms it considers to be unreal. General thoughts and their laws are mere abstractions, derived from the observations in a number of experienced matches. She knows mere subjective maxims, generalizations, not their validity in self-sustaining, concrete terms. This must be considered when a lot darker concepts that are now in circulation will penetrate up to perfect clarity. You will need to first ask: *what is it actually experience gained* in this or that object? Experience in works of philosophy you will search in vain for an objective, satisfactory answer to this question certainly justified.

Recognize an object of the outside world by its very nature, cannot possibly mean the same thing perceived by the senses and as such it represents a portrait of the same design. You will never see, such as arise from a sensory and a corresponding conceptual photography could be the relationship between the two. An epistemology which starts from this point of view, can the question of the connection between concept and object never come to terms (2). How should we understand the necessity, on the immediately go through the meaning given to the concept, if already in the former, the essence of an object would be given the sensual world? Compounded by the understanding, even if enough watching? It would be at least the term, if not a distortion, but a most unnecessary addition to the objects. This must come, if one denies the concreteness of the concepts and laws. Across from such pictorial explanations, such as those of the Herbartian school: the concept is the mental correlate of a located outside of us object, and the identification consists in the attainment of such an image, we now want to look for a real explanation of cognition. We want to here the task under which we sit, just limited to recognizing the outside world. In the act of knowing is in this case two things into account: the confirmation of the thought and the senses. The former has with concepts and laws, the latter dealing with sensual

qualities and processes. The concept and the law are always something general, the sensual object something special; the former can only be thought, the latter will only be contemplated. The media through which the General appears to us as are special, space and time. Each particular thing and every special process needs to conceptual content can be inserted in the world, because that would not be legal in him and is conceptually, not for our thoughts into consideration. Therefore, it can detect an object only mean that what appears to our senses in space, their place in the general content of the concept of the world, can even be completely given up. In recognition of a spatial-temporal object to us is nothing more than a concept or a law given in sensible ways. Only through such a view is one beyond the above-mentioned ambiguity. One has the idea to its roots, let his own form of existence built on itself and recognize him in the sense-object in another form. So we have come to a real definition of experience. The philosophy of induction can get their very nature, never to such. For it must be shown in what way conveys the concept of experience and the law. But since those two as they look at something purely subjective, so it is cut off from the outset of the way to do that.

From this we see at once how the company would be fruitless to try to make up the outer world without the help of the perception of something. How can you take possession of the concept in the form of intuition, without accomplishing the vision itself? Only when sees you, it's concept and idea of what offers the performance, but in much different form than in that of all empirical content freed of pure thought, and that this form is the decisive factor, one realizes that the path The experience must follow. Assuming, however, whether the content of the qualification, then the assertion that the same content can be acquired but also a way independent of all experience, nothing can be opposed. So experience must surely be the maxim of natural philosophy, but also knowledge of the term in the form of external experience. And here is where modern science in that it sought no clear concept of experience, was astray. At this point, she was repeatedly attacked and is also open to attack. Instead of recognizing the a priori nature of the term and to conceive the sensuous world as just another form of it, she looks the same as a mere derivative of the outside world, which is their absolute Prius. The mere form of a thing is so stamped on the issue itself. From this confusion of terms is atomism, so far he is materialistic, out. We want the same here, based on the foregoing, a careful and - as I think I can accept - subject only possible criticism.

Like how divergent the opinions in detail, last but comes atomism addition to all the sensual qualities as: sound, heat, light, smell, etc., so, if you look at the way in which the mechanical heat theory, the Mariotte law derived, even the pressure as a mere illusion, to be considered a mere function of the atomic world. The nuclear factor alone is regarded as ultimate reality. This one has now consistently denied any sensory quality, *because otherwise a thing would be declared out of itself*. It has indeed, if we proceeded to build an atomistic world system (3), the atoms are all sorts of sensory qualities, although only in very sparse abstraction, settled. Soon, we consider the same as extended and impenetrable, sometimes as mere power center, etc. This was celebrated but the greatest inconsistency and showed that, given the above, which clearly shows that in general no sensory characteristics of the atoms cannot be resolved, intent has. The atoms must have an experience of sensual existence inaccessible. On the other hand, however, they should themselves and the world in nuclear processes going forward, especially movements,

nothing to be merely conceptual. The concept is just so universal, which is without spatial existence. The atom is, however, even though not physically, but in the spaces to be there, but represent something special. It is his words not be exhausted, but beyond it having a form of existence in space. Thus the concept of the atom is added a feature that destroys him. It is analogous to the objects of external perception exist but can not be perceived. *In his words, the clarity is both affirmed and denied.*

In addition, the atom immediately announced as a mere product of speculation. If one disregards the aforementioned, quite unjustifiably same enclosed sensory qualities, it remains for him was not anything left but the mere "something" that is, of course, immutable, because in him there is nothing, so nothing can be destroyed. The idea of pure being, which is set in the room, a mere point of thought, basically just arbitrarily multiplied the Kantian "thing in itself" that we encounter.

It could be objected about it because it was quite indifferent to what is meant by atom, one should have an operation the natural historian quietly so - because too many problems in mathematical physics yes atomistic ideas are but the benefits -; the philosopher knows, after all but that one has not dealing with a spatial reality, but change with a mathematical abstraction same ideas. Turn against the adoption of the atom in this regard would be, but missed. But that's not the point. It is the philosopher to do those atomism, causality and the atom (4) the only possible driving forces of the world, which either does not deny anything mechanical or at least as consistently about our cognition beyond inexplicable holds for (5). There is another, the atom is regarded as a mere point of thought, another to want to see in it the basic principle of all existence. The former view is never the same beyond the mechanical nature, the second holds everything for a mechanical function.

Who wanted to talk about the harmlessness of atomistic ideas, one could think that the consequences of which have been drawn from the same reproach, in order to refute him. There are excellent two necessary consequences: first, that is the predicate of the original existence of further quite indefinite, mutually absolutely indifferent mindless individual substances wasted in their interaction only mechanical necessity rules, so that the rest of the phenomenal world as an empty haze same exists and the naked the random occurrence due, secondly arising therefrom uncrossable boundaries of our knowledge. For the human mind is, as we have shown that the concept of the atom quite empty, the mere "something". However, since this content with the atomists can not be satisfied, but an actual salary request, but to designate it as it can be given anywhere, they must proclaim the unknowability of the real nature of the atom.

As for the other limit of knowledge is to note the following. If you look at the mind as a function of the interaction of mutually indifferent constant nuclear complexes, it is no wonder quite why the relationship is between the motion of the atoms of one, thinking and feeling unable to comprehend the other hand, (6), which atomism, therefore, as sees a limit to our knowledge. But only to realize there is something where there is a conceptual transition. But if you advance the concepts so limited that in the sphere of a nothing place, which would allow for the change in the sphere of the transition, so the understanding is excluded from the outset. Furthermore, this transition should not merely speculative, but it would be a real process that can be demonstrated also. However, this is again prevented by

the sensuousness of the atomic motion. With the abandonment of the concept of atoms these speculations fall over the edge of our knowledge away by itself. One must be wary of anything more than this limit provisions, because beyond the limit is space for everything. The irrationality of spiritualism could as much as the senseless dogma to hide behind such assumptions. They are produced in each case to refute easily, by showing that the error is always based, to look for more than a mere abstraction, it is, or to keep just for absolute and relative terms similar errors. A large number of misconceptions is particularly come through the false notions of space and time in circulation (7).

We need these two terms thus to submit a discussion. The mechanical explanation of nature is required to pass their atomic world except in the nascent movement of atoms or absolute space, which is an empty vacuum, and an absolute time, which is an invariable standard of sequence (8). But what is space? Absolute expansion may be the only answer. But this is just one feature of sensible objects, and, apart from these, a mere abstraction, and only then on to the objects and not next to them, as the atomism must accept necessary. If expansion is to be present, so something must be extended, and this can not be re-expansion. It is here as a proof of the absoluteness of space the Kantian idea of the two gloves of the left and right hands can argue. They say the same parts have the same relationship to each other yet, and yet you can not bring both into alignment. Kant concludes that the relationship is an absolute space to another, therefore there is this. But it is much closer to assume that the ratio of the two gloves together was just so that they can not be reconciled. How should a relationship to the absolute spaces are intended for? And even supposing it were possible, but justified the ratios of the two gloves for absolute space again until the same kind to each other. Why should this not just as one can be original? The space, apart from the things of the sensible world is an absurdity. As space is simply something about the objects, so also is the only time given to the processes and the physical world. They same is immanent. Themselves are both mere abstractions. Concrete structure of the material world are only the material things and processes. They are concepts and laws in the form of outward life. Therefore, they must be in its simplest form the cornerstones of the empirical doctrine of nature. The simple sensory quality and not the atom, the basic empirical fact, and not behind the movement are the same elements. Thus it is given a direction, which is the only possible one. If you are based on the fact you will not be tempted to speak of limits of knowledge, because you are not dealing with things, which one arbitrary negative features such as supernatural attributes and the like, but actually given with concrete objects.

From these hints are also suitable for the epistemology important consequences. Above all is clear, however, that the atom and behind the empirical movement against the basic elements of the outer sensory experience must be reversed and now no longer be regarded as principles of natural philosophy.

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## Atomism and its Refutation GA 38

This edition of this article also includes Dr. Steiner's letter to Friederich Theodor Vischer (November 25, 1886) and his answers to six questions about some basic concepts of natural science (1919). The original texts were included in Zeitschrift Anthroposophie, Buch 3 und 4, 1935 23 September 1890 Translated by Ruth Hofrichter

### **LETTER TO FRIEDERICH THEODOR VISCHER** Nov. 25, 1886

Three years ago, you were so kind as to give me your opinion, an opinion of surpassing value to me, about a short essay in which I treated the mistakes of atomism, and of modern natural science in general. I had submitted to you the mss. of the essay.

This incident encourages me to send you also the attached treatise about the theory of knowledge in Goethe's view of the world.

Though the essay refers to Goethe, I confess that my main concern was to provide a contribution to the theory of knowledge rather than to Goethean research.

In considering Goethe's Weltanschauung — view of the world — my concern was not as much with his positive presentation as with the direction of his way of looking at the world. Goethe's and Schiller's scientific disclosures are for me a middle for which the beginning and the end have to be sought.

The beginning: by an account of the fundamental principles which we must think of as supporting this view of the world; the end: by an exposition of the consequences which this method of viewing the world has for our view of the world, and of life.

If I tell you that I owe much of my philosophic education to the study of your writings, you will understand how desirable it is for me to find your approval of my own thinking.

Commending myself to your benevolence, I am, most sincerely,

Rudolf Steiner

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### **ATOMISM AND ITS REFUTATION**

First, we will call to mind the current doctrine of sense impressions, then point to contradictions contained in it, and to a view of the world more compatible with the idealistic understanding.

Current (1890) natural science thinks of the world-space as filled with an infinitely thin substance called ether. This substance consists of infinitely small particles, the ether atoms. This ether does not merely exist where there are no bodies, but also in the pores (pertaining) to bodies. The physicist imagines that each body consists of an infinite number of immeasurable small parts, like atoms. They are not in contact with each other, but they

are separated by small interstices. They, in the turn, unite to larger forms, the molecules, which still cannot be discerned by the eye. Only when an infinite number of molecules unite, we get what our senses perceived as bodies.

We will explain this by an example. There is a gas in nature, called hydrogen, and another called oxygen. Hydrogen consists of immeasurable small hydrogen atoms, oxygen of oxygen atoms. The hydrogen atoms are given here as red circlets, the oxygen ones as blue circlets. So, the physicist would imagine a certain quantity of hydrogen, like a figure 1, a quantity of oxygen like figure 2. (See table)

Now we are able, by special processes, not interesting us here, to bring the oxygen in such a relation to the hydrogen that two hydrogen atoms combine with one oxygen atom, so that a composite substance results which we would have to show as indicated in figure 3.

Here, always two hydrogen atoms, together with one oxygen atom form one whole. And this still invisible, small formation, consists of two kinds of atoms, we call a molecule. The substance whose molecule consists of two hydrogen atoms, plus one oxygen atom is water.

It also can happen that a molecule consists of 3, 4, 5 different atoms. So one molecule of alcohol consists of atoms of carbon, hydrogen and oxygen.

But we also see by this that for modern physics each substance (fluid, solid, and gaseous) consists of parts between which there exist empty spaces (pores).

Into these pores, there enter the ether atoms which fill the whole cosmos. So, if we draw the ether atoms as dots, we have to imagine a body like figure 4. (The red and blue circlets are substance atoms, the black dots are ether atoms.)

Now we have to imagine that both the substance-atoms and the ether-atoms are in a state of constant motion. The motion is swinging. We must think that each atom is moving back and forth like the pendulum of a clock.

Now in A (see figure 5) we imagine a body, the molecules of which are in constant motion. This motion is transferred also to the ether-atoms in the pores, and from there, to the ether outside of the body of B, e.g. to C. Let us assume in D a sense-organ e.g. the eye, then, the vibrations of the ether will reach the eye, and through it, the nerve N. There, they hit, and through the nerve-conduit L, they arrive at the brain G. Let us assume for instance that the body A is in such a motion that the molecule swings back and forth 461 billion times a second. Then, each ether-molecule also swings 461 billion times, and hits 461 billion times against the optic nerve (in H). The nerve-conduit L transfers these 461 billion vibrations to the brain, and here, we have a sensation: in this case high red. If there were 760 billion vibrations I could see violet, at 548 billion yellow, etc. To each color sensation there corresponds, in the outside world, a certain motion

This is even simpler in the case of the sensations of sound. Here also the body-molecules vibrate. The medium transferring this to our ear is not the ether but the air. At 148 vibrations per second we perceive the tone D, at 371 the tone F sharp, etc.

Thus we see to what this whole interpretation leads: whatever we perceive in the world with our senses, colors, tones, etc., is said not to exist in reality, but only to appear in our brain when certain vibratory forms of motion are present in the outer world. If I perceive heat, I do so only because the ether around me is in motion, and because the ether atoms hit against the nerves of my skin; when I sense light, it is because the same ether atoms reach the nerve of my eye, etc.

Therefore, the modern physicist says: in reality, nothing exists except swinging, moving atoms; everything else is merely a creation of my brain, formed by it when it is touched by the movement in the outer world.

I do not have to paint how dismal such a view of the world is. Who would not be filled with the saddest ideas if for example, Hugo Magnus, who is quite caught in that way of thinking, exclaims, "This motion of the ether is the only thing which really and objectively exists of color in creation. Only in the human body, in the brain, these ether movements are transformed into images which we usually call red, green, yellow, etc. According to this, we must say: creation is absolutely colorless ... Only when these (colorless) ether movements are led to the brain by the eye, they are transformed to images which we call color." (Hugo Magnus, *Farben und Schöpfung*, 8 lectures about the relation of color to man and to nature, Breslau, 1881, p. 16f.)

I am convinced that everyone whose thinking is based on sound ideas, and who has not been subjected from early youth to these strange jumpy thoughts, will consider this state of affairs as simply absurd.

This matter, however, has a much more dubious angle. If there is nothing in the real world except swinging atoms, then there cannot be any true objective ideas and ideals. For when I conceive an idea, I can ask myself, what does it mean outside of my consciousness? — Nothing more than a movement of my brain molecules. Because my brain molecules at that moment swing one way or another, my brain gives me the illusion of some idea. All reality in the world then is considered as movement, everything else is empty fog, result of some movement.

If this way of thinking were correct, then I would have to tell myself: man is nothing more than a mass of swinging molecules. That is the only thing in him that has reality. If I have a great idea and pursue it to its origin, I will find some kind of movement. Let us say I plan a good deed. I only can do that if a mass of molecules in my brain feels like executing a certain movement. In such a case, is there still any value in "good" or "evil"? I can't do anything except what results from the movement of my brain molecules.

From these causes came the pessimism of *delle Grazie*. She says: For what purpose is this illusionary world of ideas and ideals when they are nothing but movements of atoms. And she believes that current science is right. Because she could not transcend science, and could not, as apathetic people do, disregard the misery of this belief; she succumbed to pessimism. (See Rudolf Steiner and Marie *delle Grazie*, *Nature and Our Ideals*, published by Mercury Press.)

The error underlying the theories of this science is so simple that one cannot understand how the scientific world of today could have succumbed to it.

We can clarify the issue by a simple example. Let us suppose someone sends me a telegram from the place A. When it reaches me, I get nothing but paper and lettering. But if I know how to read, I receive more than merely paper and printed signs, that is, a certain content of thought. Can I say now: I have created this content of thought only in my brain, and paper plus lettering are the only reality? Certainly not. For the content which is now in me is also present in the place A in the same manner. This is the best example one can choose. For in a visible way, nothing at all has come to me from A. Who could maintain that the telegraph wires carry the thought from one place to the other? The same is true about our sense impressions. If a series of ether particles, swinging 589 billion times a second, reach my eye and stimulate the optic nerve, it is true that I have the sensation green. But the ether waves as paper and written symbols for the telegram in the example above are only the carriers of "green", which is real on the body. The mediator is not the reality of the matter.

As wire and electricity for the telegram, so the swinging ether is here used as mediator. But just because we apprehend "green" by means of the swinging ether, we cannot say: "green" is simply the same as the swinging ether.

This coarse mistaking of the mediator for the content that is carried to us, lies at the root of all current sciences.

We must assume "green" as a quality of bodies. This "green" causes a vibration of 589 billion vibrations per second, this vibration comes to the optic nerve which is so constructed that it knows: when 589 billion vibrations arrive, they can only come from a green surface.

The same holds true for all other mental representations. If I have a thought, an idea, an ideal, it of course must be present in my brain as a reality. That is only possible if the brain particles move in a certain way, for an entity existing in space cannot suffer any changes except by motions. But we would be deadly mistaken about the content of the idea as compared to the way it appears in the body, if we were to say: the motion itself is the idea. No — the motion only provides the possibility for the idea to gain form and spatial existence.

But there is another aspect. For us men, there is nothing [in] which we are completely present as in our ideas, our ideals and mental representations. For them we live, we weave.

When we are alone in the dark, in complete silence, so that we have no sense impressions, — of what are we totally and fully conscious? — Our thoughts and ideas! After these comes everything we can experience through the senses. That is given to me when I open my sense organs to the outer world and keep them receptive. Aside from ideas, ideals and sense impressions, nothing is given to me. Everything else can only be derived as existing and ideas on the basis of our sense impressions.

Can I make such an assumption about moving atoms? If motion occurs, there must be something that moves. By what do I recognize motion? Only by seeing that the bodies



change their place in space. But what I see before me are bodies with all qualities of colour, etc.

So what does the physicist want to explain? Let us say colour. He says: it is motion. What moves? A colourless body. Or, he wants to explain warmth. He again says: it is motion. What moves? A body without warmth. In short: if we explain all qualities of bodies by motion, we finally have to assume that the moving objects have no qualities, as all qualities originate in motion.

To recapitulate. The physicist explains all sense-perceivable, all sense-perceptible qualities by motion. So, what moves cannot yet have qualities. But what has no qualities cannot move at all. Therefore, the atom assumed by physicists is a thing that dissolves into nothing if judged sharply.

So, the whole way of explanation falls. We must ascribe to colour, warmth, sounds, etc., the same reality as to motion. With this, we have refuted the physicists, and have proved the objective reality of the world of phenomena and of ideas.

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Dr. Rudolf Steiner's Answers to Six Questions about Some Basic Concepts of Natural Science. (Answered in 1919.)

(The exact questions no longer exist.)

Atoms are to be regarded as ideal contents of space. The contents are the results of force-directions meeting each other — e.g., directions of force. abc are active in space, and by their meeting a resultant force is carried which is effective as an atom of tetrahedral character.

Elements are the expression of certain meetings of forces; that they manifest themselves as such is due to the fact that one force, in meeting another, produces a result, while other effects of forces on each other are without result.

Crystals are the result of more complicated meetings of forces, atoms the result of simple meetings.

Amorphous masses result from the neutralization of force-reactions.

Force is the revelation of spirit viewed in a one-sided way. One cannot say that force has an effect on matter, since matter consists merely in the affects of the force-rays when they meet. Never does one form of energy pass over into another one; as little as the activity of one man goes into that of another. What passes over is merely the arithmetical expression of measure. If mechanical energy passes over into warmth the real occurrence is as follows: a certain quantity of this revelation which reveals itself in warmth is stimulated in a spiritual being by a certain quantity of mechanical energy. (This is so in a healthy fashion with Mayer. It was only Helmholtz who botched up this matter.)

Neither sound, nor warmth, nor light, nor electricity are vibrations, just as little as a horse is a sum of gallop-paces. Sound, for instance, is an essential entity, and the effect of this real quality in its passage through the air is vibration. For man as a sensing being, the vibration is motivation to imitate the essential entity in himself; this constitutes the perception of sound. It is similar with others: light, etc.

Light is that by which it is perceived. (See my introduction to Goethe's Theory of Colour.)  
The vibration is the revelation of light in the ether.

The refraction of light is the result of the effect of a certain force-direction upon the light-direction. Newton's colour rings (circles), phenomena of interference, are results of light-radiation (effect of light in the ether), and of the effects of other forces found in the path of light (weakening effects, gradually weakening affects of other forces). The same goes for phenomena of polarisation. One should not seek the polarisation figures in the structure of the essence of the light but in the structure of the medium which places itself in the path of light.

The speed of transmission is the result of a kind of friction of the light against the medium.

Light is not to be considered as a function of electricity, but the latter is to be considered as a kind of corporeal carrier of light.

Electrically charged matter: certain accumulations of force retain those accumulations of force which manifest as electricity.

Mathematics is the abstracted sum of the forces effective in space. If one says, "Mathematical propositions are valid a priori", this comes from the fact that man exists within the same lines of force as the other beings, and that he can disassociate himself from everything that does not belong to the scheme of space, etc.