Elementary Concepts of the Material World 1

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“OSNOVNE OSOBINE SVETA 1”

1. Concept of Field

In order to discuss laws that rule material world we must first define the concept of matter itself. To do so, we will create an abstract model – a completely theoretical paradigm that will allow us to understand how natural laws function. We will develop this abstract model starting with a simple definition and continuing throughout this book to add features and properties – until the model matches the actual physical reality in all important issues that we will discuss.

Let us start by using geometric concepts of point and direction. The reason why we choose point and direction to start with – is that the concepts of point and direction are elementary and cannot be deduced to any simpler concepts by logic.

Definition 1.1. Matter is union of points in space.

This is our basic definition of matter. We will assume that matter cannot take just about any form, but only a very specific form which we will also express through a definition. We will now use the concept of line. Line is not elementary concept as it can be logically deduced to a finite number of points on a direction, or an infinite number of points on a segment of finite length.

Definition 1.2. Matter or *field* is union of lines which intersect in a single point.

Here we introduce the word "field" which in this book has the same meaning as the word "matter". We will accept by this definition that field is either a single line of arbitrary length, or any number of such lines arbitrarily placed in space with the only condition that they all intersect in a single point.

Definition 1.3. Field in the state of uniform motion is composed of straight lines.

In the section 3 where relativity of motion is shortly discussed, we will define still state of motion and uniform motion as equivalent. That simply means that definition 1.3. equally applies to field which is, according to observer, standing still.

Definition 1.4. Changes in field propagate with finite speed.

With this definition we state that field is a body which exists in space and in time. And when we say that field exists in time, it is the same as if we said that events happen at finite speed.

At this point the concept of field is defined with a minimum set of features which allow us to derive the theorem of mass.

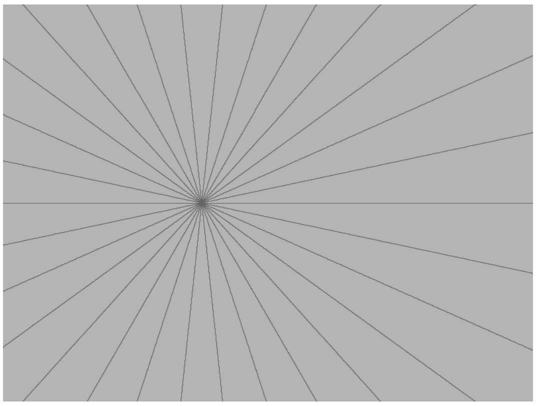


Figure 1. Example of a simple still field laid out in a plane.

1.1. Theorem of Mass

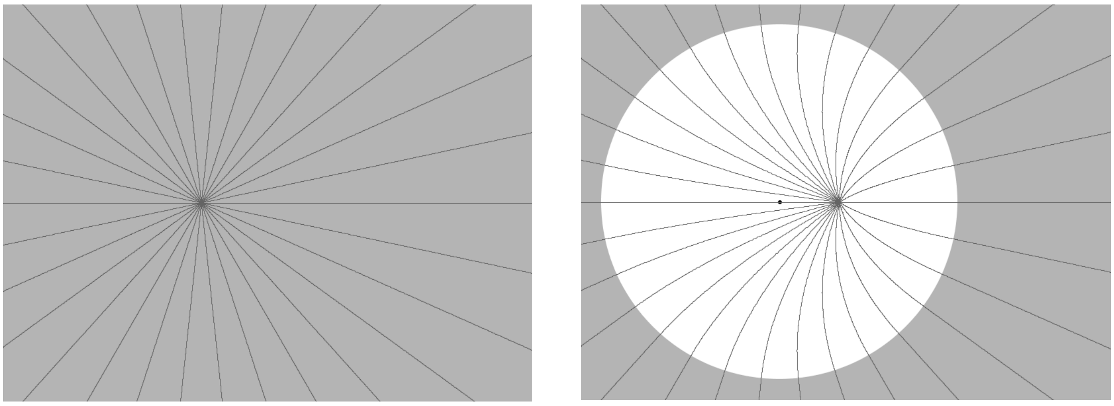
Based on definitions 1.3 and 1.4 we can derive an elementary conclusion, theorem which adds property of mass to the field.

Theorem 1.5. Field has a feature to resist every change in its motion.

> **Proof:** Let us examine the field at figure 2, which is composed of several lines. The field is still on figure 2a.
>
> From a starting moment central point of the field is being accelerated in a given direction with constant acceleration (figure 2b). During entire period of acceleration we have the following state:
>
> The central point and parts of field are being accelerated and they travel a certain distance, while at the same time peripheral points of the field have not even moved since information that acceleration began has not reached them (outside dotted circle field is still).
>
> Since information of change in motion travels at finite speed (imposed by definition 1.4), the field between central point and the border to which the information arrived (dotted circle) will be distorted.
>
> As of the moment when acceleration stops – with the reestablishment of uniform motion, the field will reclaim the initial shape (figure 2a), union of straight lines (imposed by definition 1.3). From here follows simple conclusion: The field resists acceleration by thriving to reclaim the shape it has in the state of uniform motion. ■

This theorem essentially states that mass is immanent feature of matter: Matter cannot exist in space and time and have no mass. Without mass, matter would not have the means to maintain its form in dynamic world.

Affection of field to resist acceleration is called inertia or mass. The two names are introduced in this book as synonyms, which means that they both represent exactly the same property of matter.



a) b)

Figure 2 a) Field in state of uniform motion, before and after acceleration. **b)** Field in state of constant acceleration. White circle represents the border to which information of acceleration has reached up to the given moment. Outside the white circle the field had no way of knowing that acceleration even began.

If the acceleration would continue for some more time on fig. 2b, the field would break up, as the center of the field would reach speed higher than that at which information is traveling.

At this point we could have a theological debate over whether that is possible in the real world or not. So we will for the time being resort to using a definition to state that field cannot break up.

Definition 1.6. Field is indestructible.

This definition implies that mass of a field is not a constant value. When force is applied on the field, its inertia must grow along with the deformation in order to keep the field together.

Based on current definitions we can only confirm that this feature exists, but unfortunately we cannot derive a mathematical expression which would describe how inertia increases with deformation of a field.

1.2. Absoluteness of Motion

There are two opposing concepts, absoluteness and relativity. Both need to be explained.

Absoluteness is unique and undeniable truth: an unconditional reality. The opposite of that, relativity is concept of having a choice of multiple truths.

The consequence of acceleration is not only change of object's location in space. As we have demonstrated with theorem 1.5, when matter is accelerated, it suffers structural changes of its form.

This makes accelerated motion of a body an unconditional truth: it is absolutely real. It cannot be denied by changing the system of reference.

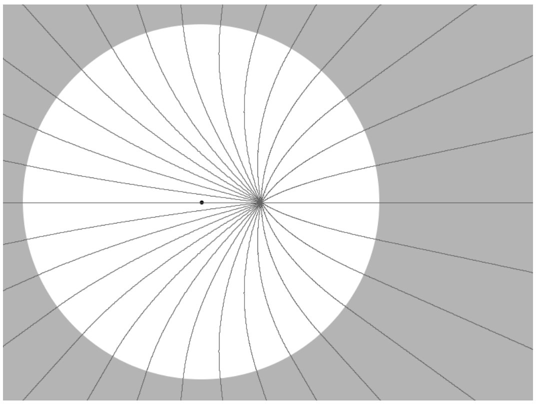


Figure 3 Example of a field distorted by acceleration. White circle shows how far the information that acceleration began has traveled.

As there is no known state of no interactions, this simply means that motion of every electron, proton or atom, of every object in universe is always accelerated and therefore undeniable and absolute.

Perhaps it will be useful for some readers to explain why there is no known state of no interactions: uniform motion is an idealistic concept; it implies that some object can move in a perfect straight line with constant velocity.

We can only imagine such idealistic situation, as in reality we live on a planet that revolves around our closest star on an elliptic path. Our solar system travels around galactic center on another elliptic path. Our galaxy is probably hurling towards Virgo cluster of galaxies. And that is probably not the end of the list. At any point in space every object is exposed to the influence of entire universe. We live and participate in a complex world of motion on subatomic, molecular, macroscopic, planetary and galactic levels. When for some real motion of an object we state that it is uniform, it really means that it is perceived as motion in a straight line with perceived constant velocity. Therefore we are simply approximating curvature with a straight line, just like we are rounding off variable speed. Our actions are of limited precision.

1.2.1. The Concept of Relativity of Motion

It is an unfortunate fact that physics still applies the concept of "multiple truths" - the relativity, on the motion.

This concept is based on premise that motion is nothing but change of position in space, where the only quality added by acceleration is changing velocity.

Relativity states that one can pick an object as a point of reference and consider it to be motionless, while the universe is moving around. Any number of such assumptions for different objects made by anyone else would be, according to relativity, equally and literally true anywhere in time and space.

However reasons stated above for absoluteness of motion are fully sufficient to retire entire concept of relativity of motion for good.

The mathematical background behind the special theory of relativity is also discussed and disproved in a point-by-point article Triangle of Velocities.

Appendix

Hypothesis On The Nature of Gravity

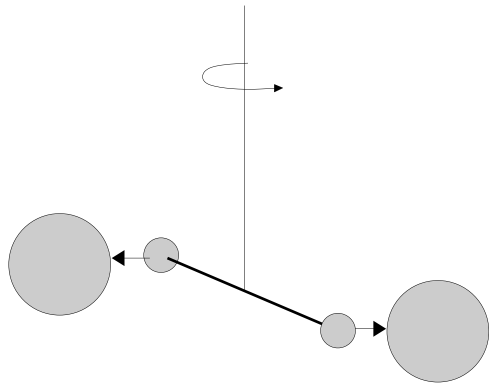
In Elementary Concepts of Material World mass is inertia – a quality of matter and not matter itself, thus literal consideration of mass for the cause of gravity is absolutely meaningless. Because of this we must try to answer the question – what the real carrier of gravity could be?

Newton's gravity law states that gravitational attraction is proportional to the product of masses of two bodies. Mathematical proportionality however does not necessarily have anything to do with the “cause” or the “carrier” of gravity. If you like, the intensity of electrostatic field of large number of electrons can be expressed as proportional to their mass. Yet it is clear in this case that mass of electrons has nothing to do with electrical field.

Newton's law of gravity was first confirmed in laboratory conditions when in 1798. Henry Cavendish performed an experiment with torsion scale, with a goal to determine attraction between massive lead spheres. In original experiment, and in later more accurate measures results were retrieved which showed very weak, but measurable attraction. Experiment served to calculate very important proportionality constant γ of Newton's gravity theory. We will try to answer what Cavendish actually measured here.

The effect of molecular forces among macroscopic bodies can be seen in the form of surface tension with drops of liquids. Under effect of surface tension drops of a liquid tend to form spherical shapes. While this occurrence is rendered for all liquids in zero gravity conditions, in everyday conditions it is strongly visible with drops of mercury. Scattered mercury from a broken thermometer forms tens of tiny drops of almost perfect round shape. It can be observed that drops of mercury attract when placed near one another – they tend to form a larger drop. This attraction exists among all substances of the same kind, but among macroscopic bodies, with rare exceptions such as mercury, it is weak and imperceptible. Today it is widely accepted that this attraction is caused by molecular forces. The same fields which are responsible for forming the structure of matter on molecular level and for chemical reactions among substances, cause this macroscopic phenomenon. Molecular forces are of electromagnetic nature and follow very complex patterns of behavior. Due to complexity of molecular fields, it remains unexplained what resulting field can be experienced neither in vicinity of molecules nor at macroscopic distances. However we know for a simple empirical fact that these forces determine chemical properties of all substances and also phases and mechanical features such as elasticity. On distances that by far surmount dimensions of molecules, affection of molecular forces drops sharply below threshold of detectability of instruments typically used for this purpose.

If we wanted to perform an experiment to determine behavior of molecular fields on macroscopic distances, we would be left with perhaps no other apparatus but essentially the one Cavendish used: with as much matter concentrated in two or four points, we would measure their attraction with torsion scale. But if we do the same as Cavendish what are we measuring then?



Torsion balance for measuring molecular forces between macroscopic bodies. Weak forces are magnified by using as much matter as possible concentrated in two or four spheres, and then measuring torsion of the wire which holds smaller weights.

Based on this we can formulate the following hypothesis on the origin of gravity:

Molecular forces on distances comparable to the size of molecules determine chemical and mechanical features of all substances. On large distances all substance-specific chemical qualities diminish and what remains of molecular forces is equable weak attraction towards all other substances. The remnant attractive molecular force is proportional to the quantity of matter (expressible through mass), and reverse proportional to the square of distance between bodies. This attraction is gravity.