

4. Durch die Komplexbildung entsteht ein einheitliches System von π -Elektronen

Dadurch wird die Extinktionskurve, eventuell unter gleichzeitiger Strukturänderung nach den langen Wellen verschoben.

5. Die Komplexbildung wird durch chemische Reaktionen begleitet.

Dadurch wird die Struktur der Extinktionskurve verändert. Eventuell kann der zeitliche Verlauf der Extinktionsänderung befolgt werden. Als Beispiel kann die Halbazetal, bzw. die Hydratbildung bei den Aldehyden und Ketonen erwähnt werden.

Allgemein kommen die erwähnten Effekte nicht rein, sondern gemischt vor. Versuche sind im Gange um die Brauchbarkeit dieser Systematisierung zu zeigen.

Szeged (Ungarn) Juli 1949.

On Newton's Laws of Motion

By K. SZÉLL

The classical mechanics, founded by Galileo and Newton, developed by many famous mathematicians and physicists is a logically self-consistent and fundamental part of physics. The science of mechanics rests primarily upon the three Newton's laws of motion:

I. Every body continues to be in a state of rest or of uniform motion in a straight line unless it is compelled by force to change that state.

II. Change of motion is proportional to the force applied and takes place in the direction in which the force acts.

III. To every action there is an equal and opposite reaction, or the mutual reactions of two bodies are equal and opposite.

I show in the following lines that Newton's laws of movement are synthetic judgements which can easily be proved by the aid of the law of cause, on the base of dialectical materialism.

Faith in the exterior world, independently from the observer, is the base of natural science. Every knowledge assumes a subject (who perceives something) and an object (which is perceived). The objects of the exterior world produce pictures in us, which we construct by the action of contemplation and intellect. The causal relation is the condition by which we acknowledge something to be existing, i. e. that we accept it as an object. According to the law of cause therefore whatever brings about a change in us exists for us. Furthermore it also means that every happening has a cause. The law of cause is the law of change, it is therefore not the law of the origin of existence and so only the cause of change can be sought for.

The laws of nature are always composed of two factors. The one factor being action and the other contemplation. The action occurs on the base of the law of cause, contemplation applies to the empirical elements needed for perceiving nature.

I. Direction belongs to the conception of movement it is given by the spacial direction of the action. If there is no exterior cause the direction of the action does not change, the body always proceeds in the same direction. On the other hand, if an exterior cause is lacking the $s/t = v$ velocity equation is constant. This equation establishes an intellectual factor derived from the quotient of our two contemplations. The first law of movement can therefore be justified by the lack of cause. *This first law is a synthetic judgement based on experience.* The investigators who state that the first law *cannot be justified on the base of experience*, draw this conclusion from an entirely mathematical point of view¹. We must choose the frame of reference in such a manner that this law should be valid.

II. Newton's second law is the definition of force. In the second law „motion of a body“ means mass of the body \times its velocity and the change of motion means the rate of change of momentum with respect to time. Assuming that the mass remains constant.

$$\frac{d}{dt} (\text{mass} \times \text{velocity}) = \text{mass} \times \text{acceleration}$$

This equation does not tell what force is. It merely says that forces are measured by the accelerations with which they are associated.

In the pictures of the objects the sensual data do not point toward the cause. On the pictures there is no such feature which would define them as cause or effect. The causal relation joins the sensual data on the base of the logical arrangement of the pictures. The establishment of the cause and effect expresses a synthesis which is produced by the observer (the subject) on the base of experience.

Consciousness takes up a casual relation because it remarks a change. Of two objects we define as effect the one which has changed, the constant one (if it is also only relatively so) we consider as cause. For the intellect the constant is the cause and the variable the effect. Logically the cause must be prior to the effect. This is, however, not a time but a logical priority. Therefore the action, the force is the cause, the acceleration the effect.

¹ Cf. A. Voss, Encyklopädie der Mathematischen Wissenschaften, IV, 1. pp. 54. „.... Überdies, ist es eine Täuschung, wenn man glaubt, dass sich in der Erfahrung dasselbe (das Trägheitsprinzip) nachweisen lasse. Allerdings lässt sich erkennen, dass die Abweichungen von der Trägheitsbahn kleiner und kleiner werden, je mehr man gewisse die Bewegung beeinflussende „Umstände“ beseitigt; dass aber, wenn der Punkt sich gleichförmig und geradlinig bewegt, solche Umstände nicht mehr vorhanden sind, wird schon vorausgesetzt und liegt jenseits aller möglichen Erfahrung... Man kann sich daher sehr wohl eine Mechanik denken, bei der die Bewegung des unbeeinflussten Punktes eine ganz andere wäre, so z. B. F. Reech im Cours de mécanique, vgl. Fussn. 72; dann J. Andrade, Mécanique physique; ähnlich äussern sich auch H. Poincaré und P. Painlevé. Revue de métaphys. 8. 5. (1900) pp. 557; auch schon weit früher Jacobi in seiner Vorlesung 1847/48, p. 1.“

Mac Millan draws conclusions from a purely mathematical point of view. I quote from his book „Theoretical Mechanics, Statics and the Dynamics of a Particle“ (1927) p. 37.: „It will be observed that Newton's second law says nothing about causation. Since the force and the acceleration are simultaneous, there is no more reason for asserting that force is the cause of the acceleration than for asserting that acceleration is the cause of force. The fact that force is commonly spoken of as the cause of acceleration merely shows that in order of our thoughts, force is commonly placed before acceleration. In the philosophical sense, nothing is known about causation“. In his establishments on acceleration Mac Millan did not take into consideration logical priority so that his assertions cannot be accepted. There is an essential difference between the purely mathematical point of view and the physical content of the law.

If there is no exterior action it ensues from the force equation: mass \times acceleration that the velocity according to its magnitude and direction is constant. Therefore the second law of movement also involves the first one, which is a generally accepted fact.

III. In the third law the words *action* and *reaction* are to be understood as forces. Action is the cause, reaction is the effect. They are equal in magnitude and opposite in direction. Logically three cases are possible:

1. The magnitude (A) of the force of cause is greater than the magnitude (B) of the force of effect: $A > B$. 2. $A = B$. 3. $A < B$.

If A is greater than B , then the cause would comprise such a factor which did not contribute to the effect.

If A smaller than B , then B would comprise such a factor which does not ensue from the cause.

It is therefore necessary that $A = B$ that is the effect is equal to the counter-action. As the reaction appears as a resistance its direction is in opposition to the action.

To Newton's three laws of movement, to the axioms there is still attached a fourth according to which the forces are to be added as „vectors“. On the base of Newton's mechanics, Newton's second law of movement contains this. Generally forces from different directions are to be added on the base of the parallelogram thesis, logically this ensues from the multiple cause thesis.

The laws of movement are often also called axioms. As, however, the denomination axiom signifies a thesis which cannot be proved, the denotation: laws of movement is more appropriate.