

**FROM SYNCHRONIZATION
OF THE ATOM TO ORGANIZATION
OF THE UNIVERSE VIA GRAVITATION**

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1 Introduction: Aim and scope of the paper

Our aim is to design a model in the sense of a scientific hypothesis in which the gravitational force is explained as an electromagnetic effect. Since mass is equivalent to energy, it seems to be natural that gravitation does not play an exceptional role in the series of basic physical forces or interactions, but is integrated into the electromagnetic character of the other physical forces. Thus a further search for gravitons or any new particles which transmit the gravitational force is superfluous. We think that general experience in physics recommends to try to explain phenomena with as few causes as possible. Moreover, the search for new particles which could transmit the gravitational force was long and unsuccessful.

Another remarkable effect is that the law of gravitation has the same structure as Coulomb's law for the interaction between electric charges at rest: The force of attraction respectively repulsion (according to the signs of the charges) is proportional to the product of the magnitude of the charges and inversely proportional to the square of the distance between them, see e.g. Purcell (1965), p. 7 ff. Moreover, down to distances less than 10^{-12} m, no quantum modifications of the electromagnetic forces have to be taken into account according to Purcell (1965), p.3. Considering the size of an atom on the scale of 10^{-10} m and the fact that "electromagnetic forces are the only essential forces which act on electrons" according to Wichmann (1989), p. 34 resp. p. 45, the impact and importance of electromagnetic forces on atoms and any agglomeration of matter and its conditions are clear.

Of course, the explanation or model presented here is far from being complete or even detailed. It is up to physicists who study elementary particles to justify the model by suitable measurements.

A consequence of that model is the view that the basic or original subject of nature is electromagnetic energy and not matter, matter is conceived as materialized energy.

2 The electromagnetic structure of atoms: The origin of gravitation

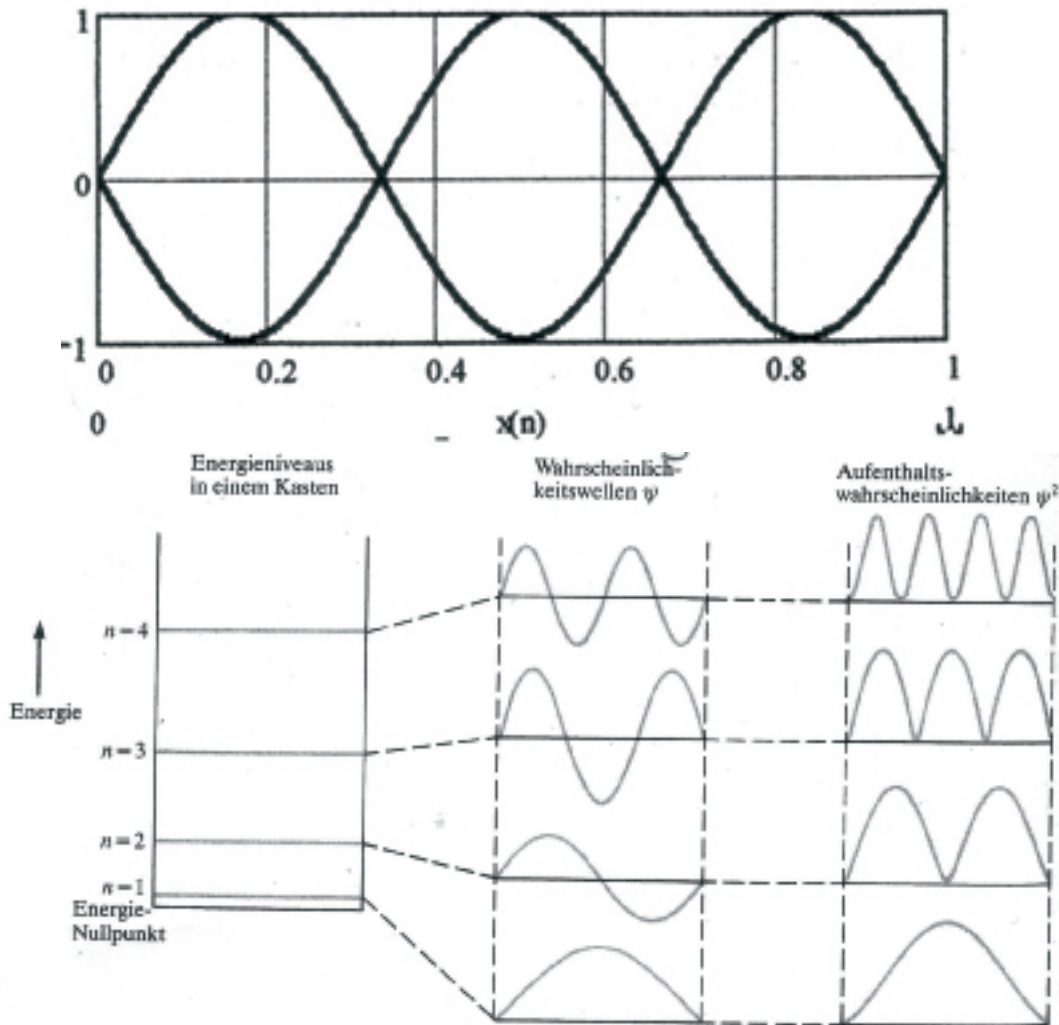
The key to our explanation is that an atom is not completely neutral in the sense of electric charges. This effect is caused

- (1) by a certain Kind of synchronization of the atom and
- (2) since the hull of electrons is a rotating system of charges like e.g. a ball-lightning.

These two principles rule the interplay between positive and negative charges of an atom in itself (1), and of different neighbouring atoms (2).

We refer to the wave-character of matter with respect to de Broglie, Schrödinger et al., see e.g. Gerthsen and Kneser (1966), Crawford (1968), Hey and Walters (1998).

In that context an electron can be modelled as a standing wave formed by a wave packet on some elliptical orbit around the nucleus. It forms a cloud of charge along its orbit. The spatial density of the cloud of charge is given by the intensity of the standing wave, which is defined as the square of the absolute value of the wave function. The intensity as a real-valued function with the unit interval $[0, 1]$ as range represents respectively can be interpreted as the density of the sojourn probability of the electron on its orbit. That means: The probability of the electron being in a neighbourhood of a point, where the intensity function has a value near to 0, is very low, the probability of the electron being in a neighbourhood of a point, where the intensity function has a value near to 1, is very high.



Our hypothesis of the synchronization of the atom means that the distribution of protons in the nucleus corresponds to the hull of electrons in such a way that positive radiation of the nucleus, i.e. the protons, overcomes the hull of electrons, since the position of protons relates to points in the hull of electrons, where the intensity function is near to 0.

Therefore an atom is a “synchronized” system, as the interplay between protons and electrons is organized in such a way that the collection of all electrons does not interfere with the collection of all protons so as to neutralize the positive charge of the nucleus as a whole.

The size or the power of the excess of positive radiation of the nucleus depends on

- the number of protons, neutrons and electrons,
- the distribution of the electrons over the different orbits of electrons,
- and of course on conditions of the neighbourhood of the atom under consideration.

3 The electromagnetic interaction between atoms

As for the interaction of two neighbouring atoms A and B we have to consider: First, the excess of positive radiation of both atoms as two synchronized systems, next the negative charges of the both hulls of electrons. What is the result of that interplay of different charges?

We have to take into account:

First, there are two attractive forces, one $F_{nA,eB}^{attr}$ between the nucleus of A and the hull of electrons of B , and by symmetry an attractive force $F_{nB,eA}^{attr} = F_{nA,eB}^{attr}$ between the nucleus of B and the hull of electrons of A . Next, there are two repulsive forces, one $F_{eA,eB}^{rep}$ between the hulls of electrons of A and B , and one $F_{nA,nB}^{rep}$ between the nuclei of the both atoms.

The repulsive force $F_{nA,nB}^{rep}$ is extremely weak, since part of their positive charges is shielded by the both hulls of electrons and because of the “large distance” between the both nuclei with respect to Coulomb’s law.

The repulsive force $F_{eA,eB}^{rep}$ between the both hulls of electrons is not strong, as the hulls are near to each other both on a “mean level of intensity” and the charges of electrons are distributed along the whole orbit. Moreover, we point out that the hull of electrons is a rotating system of electric charges: Comparing it with a ball-lightning indicates that the repulsion force of the two electronic hulls is very weak, even more, a ball-lightning e.g. may attract more negative electric charge up to a certain level. Such an effect generally may be explained by the law of nature that rotation of any physical system creates a certain self-dynamics of the system, thus leading to a stabilization

of the system.

Because of synchronization of the atom the dominating forces are the attractive ones: $F_{nA,eB}^{attr}$, $F_{nB,eA}^{attr}$. The positive radiation of the protons is focussed on certain “windows” within or along the orbits corresponding to sections of the orbits where the intensity functions of the electrons have values near to 0. That focussed radiation attracts the hull of electrons of the neighbouring atom.

The balance of those forces is:

$$2F_{nA,eB}^{attr} > F_{eA,eB}^{rep} + F_{nA,nB}^{rep},$$

i.e. the acting attractive forces are stronger than the sum of the both repulsive ones.

The remaining difference in our inequality is the gravitational force $F_{g;A,B}$ between the two atoms, i. e. introducing $F_{g;A,B}$ makes the inequality to an equality:

$$2F_{nA,eB}^{attr} = F_{g;A,B} + F_{eA,eB}^{rep} + F_{nA,nB}^{rep}.$$

As a consequence the attractive gravitatuional force between atoms A and B is given by

$$F_{g;A,B} = 2F_{nA,eB}^{attr} - F_{eA,eB}^{rep} - F_{nA,nB}^{rep}.$$

By introducing a suitable constant g_a (the index a referring to the atomic scale) $F_{g;A,B}$ may be conceived as attractive force between two point charges g_1, g_2 at rest of opposite sign, each point charge resting in the nucleus of its atom. Therefore $F_{g;A,B}$ may be represented inversely proportional to the squared distance r^2 of the both centers of the nuclei according to Coulomb’s law:

$$F_{g;A,B} = g_a \frac{q_1 q_2}{r^2}.$$

More detailed calculations for the very special case of a hydrogen atom are done by Vlasak (1999).

There even remains an excess of positive radiation of the two neighbouring atoms which is directed towards the hulls of electrons of other neighbouring atoms. For a physical body consisting of N atoms therefore an electromagnetic field of positive charges results. Newton’s Law of gravitation means: For

two physical bodies with masses m_1 , m_2 at distance of r of their barycenters the gravitational force between them is

$$F_G = g \frac{m_1 m_2}{r^2},$$

with the gravitational constant g . In some sense Newton's law is a consequence of Coulomb's law which becomes active on the atomic scale because of our principles (1) and (2).

4 Consequences

Our model respectively hypothesis is based on an essential asymmetry of the interplay between positive and negative charges dependent on belonging to the same atom or not. Due to the "synchronization" of the atom and the rotation of electrons the hull of electrons is something like a semi-permeable diaphragm for positive charges: It lets escape an essential portion of radiation of its own nucleus, but shields its own nucleus against positive radiation of neighbouring atoms. By such an interplay of positive and negative radiation atoms may agglomerate to a body with an excess of positive radiation which is active also outside the body, thus explaining gravitation.

In a previous paper (Helmecke and Herkenrath (2003)) we dealt with and explained basic cosmic laws concerning dimensions, (evolutionary) causality and stability/instability. Those cosmic laws in combination with our hypothesis on gravitation lead to important consequences for dark matter, black holes and the structure respectively evolution of the universe. Since matter of a black hole has lost its atomic structure, black holes only attract and absorb other matter: They have an effect on other matter but do not interact with that. The condensation of matter in a black hole does not only destroy the space-structure of atoms, but even more the space-time-structure.

That implies for the cosmic evolution: Since the big-bang the universe expands into all directions. Within the galaxies black holes arise due to excessive mass-concentrations according to the cosmic law of critical stability (see Helmecke and Herkenrath (2003)). Those black holes destroy the surrounding matter and thereby the space-time-structure. Since the natural dimensionality disappears, the distances in space of the different black holes disappear,

too. There arises a singularity in which the whole energy of the universe is concentrated. As the principle of evolutionary causality remains valid (see Helmecke and Herkenrath (2003)), and the stability of that state reaches a critical value, a new big-bang arises according to the cosmic law of critical stability. A slowing down of the expansion of matter up to its reversion is not necessary to explain origin and end of the universe.

Finally, if gravitational effects can be explained as electromagnetic interactions, no concept of dark matter is needed, i.e. a corresponding matter needs not to exist, but only electromagnetic energy.

5 References

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