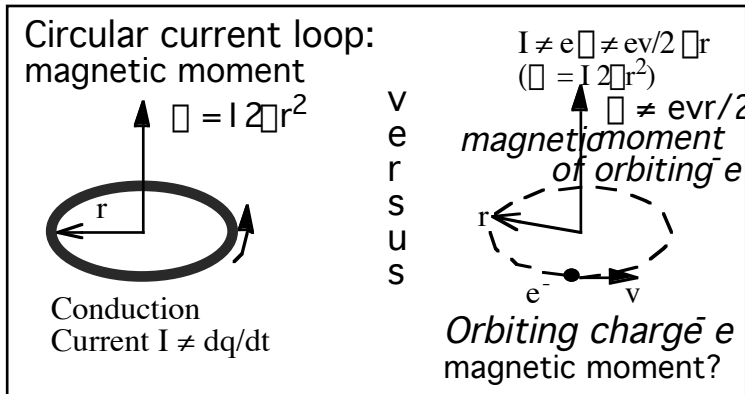


**Hydrogen fine structure cannot be the rationale for doublets.
Electromagnetism of orbiting and spinning electrons inherently flawed.
No evidence for orbiting and spinning electrons.**

In Bohr's original atomic model a *spin* of the orbiting electron was not mentioned. Electron spin was *ad hoc* invented in order to explain the line splitting.

Textbooks often misunderstand the role of electron spin when they declare that *splitting ... was one of the first experimental evidences for electron spin*. [hy] Doublets are an experimental fact that can be explained by different theories. Explaining theories should be reasonable ones...

Current theory claims that *the small splitting of the spectral line is attributed to an interaction between the electron spin S and the orbital angular momentum L. It is called the spin-orbit interaction...* *The energy levels of atomic electrons are affected by the interaction between the electron spin magnetic moment and the orbital angular momentum of the electron. It can be visualized as a magnetic field caused by the electron's orbital motion.* [hy]



Because the electron's spin can have the states $\uparrow S$ (spin up) or $\downarrow S$ (spin down, depending on the rotation on its axis), so called interaction energy takes 2 different values and the corresponding electron jumps create photons with a minute energy difference. This is the explanation for splitting. Is it plausible? Current theory

claims that the orbiting electron is an electric current and that this circular current represents a magnetic moment. See the article *Electricity* where I show that the electric current is not a flux of electrons. Therefore the analogue between a *current (a misnomer!)* in a circular wire and an orbiting electron does not exist.

Also the **Stern-Gerlach experiment cannot be crucial for the existence of orbiting and spinning electrons**. The outcome of this experiment is only that atoms are little magnets or are composed of little magnets. These magnets can be either permanent (ring) magnets or minute solenoids; they must not be an effect of moving charges!

The present author assumes that atoms are made up of hydrogen atoms and that hydrogen is made up of permanent elementary ring magnets.

To summarize: There is no empirical evidence for orbiting and spinning electrons. Because an orbiting electron produces radiation, the electron must fall into the kernel due to the energy loss. Also the nature of the erroneously so-called inertial force of the electron remains unexplained. According to Schroedinger the electron and its movements are not real, they are only auxiliary things 'as if'. Schroedinger assumes waves as constituents of the atom. The question of what is waving cannot be answered by Schroedinger's theory. If the waves are made up of charge then accelerated charges produce radiation. Due to the energy loss the waves must crash into the nucleus.

The Bohr atomic model with a positively charged nucleus and extra nuclear negatively charged electrons does not work. The creation of a photon out of an energy difference during an electron jump is mysterious. The primordial defect of this model is its ontology. It is a modern version of atomism. Corpuscles have their interplay with distant or apparent (inertial) forces in the vacuum.

Zeeman and fine structure splitting troublesome for gyroscopic g-factor of electron spin

The Zeeman effect shows another line splitting. It is due to magnetic fields exerted on the atoms. Jackson [jak] described the troubles of the *ad hoc* invented electron spin with *fine structure* and *Zeeman splitting*: If the g-factor of the electron is 2 then the *anomaly* Zeeman effect and the existence of multiplet splitting are explainable but the observed fine structure splitting are only half the theoretical ones!

If the g-factor is set for 1 then one obtains the correct fine structure splitting but the Zeeman effect is now the so-called *normal* Zeeman effect. According to Jackson, Dirac's relativistic electron theory explains consistently spins, g-factor and spin-orbit interaction. There is no obligation for me to go in the details of quantum theory troubles and endless *ad hoc* inventions (for example the Thomas precession) because the existence of an extra nuclear orbiting and spinning electron is physically impossible and was never empirically corroborated.

Experiments show only that atoms consist of minute magnets. It is possible that these magnets are permanent ones. That a circulating charge in microphysics is a magnet according to formula

$\mu = (ge/2mc) (\pm\hbar/2)$ is highly speculative because there is no parallel between a current in a closed loop and a moving charge on a circle. According to the duality theory of matter and waves the electron should be also a standing wave. In the quantum theory literature no efforts are made to explain the magnetic moment of the spinning electron in terms of a standing wave! According to the complementary principle one can arbitrarily choose between the two pictures. In fact, all calculations, even wave mechanics, have the particle picture as their ontological basis.

What is the cause for the 6 cm hydrogen radiation?

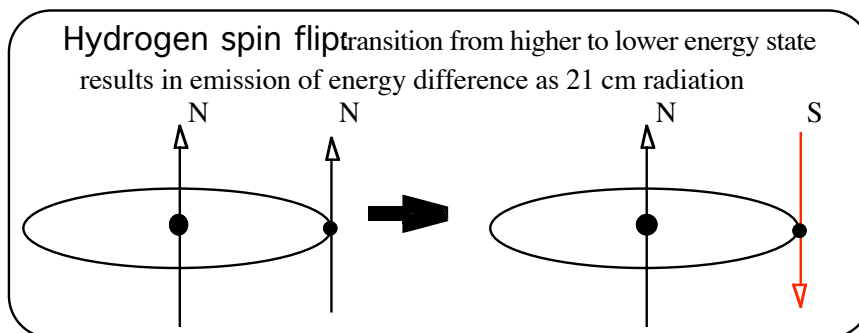
In terms of current theory a 6 cm radiation corresponds to a photon with a frequency of $5 \cdot 10^9$ Hertz and an energy of $20.6 \cdot 10^{-6}$ eV. To explain this tiny energy, physicists had to find out a corresponding quantum jump. The trial and error method showed that an electron must jump from the 139th to the 137th orbit in order to create a photon with $20.6 \cdot 10^{-6}$ eV energy! [voigt] (The formula for the energy is: $13.6 \text{ eV} (1/137^2 - 1/139^2)$) The radii of these orbits are huge. The formula for the radii is $r = n^2 r_1$ where r_1 is the Bohr radius $5.3 \cdot 10^{-11}$ m. For $n = 137$ we obtain $r = 9.9 \cdot 10^{-7}$ m and for $n = 139$, $r = 10.2 \cdot 10^{-7}$ m. As a result the atom is inflated about 20 000 times! One must ask the question: What is the reason that in this range there occurs in nature only this jump from the 139th level to the 137th? Why are there not other jumps, which correspond to 1cm, 2cm, 3cm, radiation? In any case, every occurring wavelength can be explained by an electron jump because the number of orbits is not limited. The Bohr model is therefore more successful to explain the phenomena (numerically) than the model of Ptolemy because to add 137 epicycles would be abstruse. But for a given photon energy there is not only one possibility for a jump that correspond to this energy. If so many orbits are possible then also a jump between other orbits may have about the same energy! This is the real uncertainty principle of the Bohr model: the correspondence between measured wavelengths and the alleged quantum jump is arbitrary.

What is the cause for the 21 cm hydrogen radiation?

The most important spectral line in astronomy is the 21 cm hydrogen radiation with about 1430 MHz. In terms of the Bohr atomic model this line must correspond to a transition of the electron with a very tiny energy difference.

Surprisingly, physicists did not explain this tiny energy by an electron jump! Such an electron jump, say from the 212th level to the 210th level seemed to be very improbable. Why? The calculated photon energy for this jump is $5.81 \cdot 10^{-6}$ eV and therefore in range of the values for the 21cm radiation that is about $5.84 \cdot 10^{-6}$ eV. But the radius for the 212th orbit is 45 000 times the Bohr radius!

Now the arbitrary claim is that the electron in this case is not jumping between orbit energy levels but that this *hyperfine* transition is a change in the direction of the spin axis in the ground state. Allegedly the state with parallel proton and electron spin axes changes into a state with an anti parallel axis direction of the electron.



the two states becomes converted into a 21 cm photon...

Because the cosmic hydrogen should tend to achieve its lowest possible energy state, why is not all the hydrogen in the galaxy in the

lower energy state by now? Consequently there should be no 21 cm radiation! One explanation was that there are enough atomic collisions to boost the electron into the higher energy states... The answer raises a new question: only for collisions with the quantized minute energy of about $6 \cdot 10^{-6}$ eV required to change the spin state absorption takes place. Collisions with a bit more or less energy must be without any effect! Collisions must exercise a peculiar selectivity with respect to the values energies can take on! But not only the selectivity is very strange. Also the mechanism that works a spin to flip is the classical *black box* situation. How is the torque produced that flips the spin?

According to quantum physics the calculated energy difference for the spin flip is $5.84 \cdot 10^{-6}$ eV with corresponding wavelength and frequency of 21.2 cm and 1.414 GHz, respectively.[br] Observations from several different regions of interstellar space show that the peaks of the 21 cm radio spectral lines do not all lie at the theoretically required 21.2 cm wavelength. One explanation given is *because the gas in the Galaxy is moving with respect to Earth*. But the peaks should shift also with temperature. Like for blackbody emission the peaks move to shorter wavelengths as the temperature in the interstellar spaces increases. A wave from distant stars undergoes a loss of energy. For such a minute energy this loss of energy is important... The claim for 'empirical confirmation' of the spin flips is untenable. In such a manner Ptolemy's geocentric model with its eccentrics, deferents and epicycles was 'empirically confirmed' due to the observed retrograde motion of e.g. Mars.

The spin flip speculation is very implausible. A plausible alternative is the assumption that in the cold interstellar space the oscillating hydrogen atom has a natural frequency of >1.4 GHz that causes a vibration of the cosmic electromagnetic medium with about 1.4 GHz.

The 21 cm radiation was categorized as *hyperfine* structure. Another variety of the hyperfine structure is caused by the spinning nucleus and its interaction with the electron's orbit. Because the existence of orbiting electrons is physically impossible and was therefore never empirically confirmed, we must not go into the details.

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