Why Heisenberg-Schrödinger's atomic model is invalid

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Abstract- Outstanding surprisingly the misconception regarding the phenomenon potential energy most likely caused the change from Rutherford-Bohr's to Heisenberg-Schrödinger's model.

Introduction

In the past 100 years, physics has become a science that is no longer comprehensible and must have led to the most exotic, widely divergent views and at least 100 unsolved problems. This article draws attention to this result on the basis of a critical look at the relevant atomic models.

Atomic models

Rutherford-Bohr model

The most common objection against Bohr's atomic model is found in the words below, copied from Internet sources.
"Electrons that gained energy would jump to higher energy levels and become "excited", and as they jumped back down to the ground state, they would emit that energy. However, this model worked well for only the simple Hydrogen atom. Although this model is now considered obsolete, it is still used to showcase basic understanding of the structure of an atom."

"The Bohr model depends on a connection between the frequency of light and the energy of the level change. If light of a frequency, corresponding to the energy change, interacts with the atom, the electron can absorb the light and jump up a level. If an excited electron jumps down a level, it looses energy. The energy the electron loses becomes light with a frequency corresponding to a change in energy."

The common bewildering misconception in these words is the conception that electrons in larger orbits contain more energy than in lower orbits. This misconception has clearly led to the rejection of Bohr's model and to the search for "better" models.

Reference [1]: "Conventional Definition of Potential Energy is Controversial" shows in detail the evidence of what is just qualified as "misconception". This evidence will be summarized below.

Potential energy can mathematically be represented by $E_p = \int F(r)\, dr$, with $F(r)$ a force along a yet to be defined path. The background for this mathematical model is that potential energy is defined as the work-to-be-done to separate two objects from each other in case these objects attract each other. For example: bring a mass to a larger height relative to earth. The fundamental question is: has such energy to be considered as positive or as negative? In the chosen situation it would be strange to imagine such energy as negative, because it actually requires work to separate the mass from the earth.
In this example $F(r) = C/r^2$, so $\int F(r)\, dr = -C/r_r^{\infty} = -C(1/\infty - 1/r) = C/r$, with r the initial distance between the both masses. This result is fully in line with the previous reasoning. The smaller this initial distance r is the more energy it takes to increase the distance between the objects.

Notwithstanding this most logical argumentation, potential energy is, since time immemorial, calculated as negative, by taking the lower boundary as ∞ and the upper boundary as r.

Reference [1] shows that in case of an orbiting electron the absolute value of its potential energy, so avoiding the problem of its sign, equals 2 times its kinetic energy. If the sign of the potential energy were now taken as negative, the total energy of the electron would become negative. A physical law says that the centripetal force equals the centrifugal force all the way along a perfect circular orbit. As a result, the larger the radius of an orbiting electron, the lower its orbital velocity, so its kinetic energy, because the larger the distance between electron and nucleus the smaller the Coulomb/centripetal force between these two.
Following the generally accepted argumentation, an electron orbiting at a larger radius has a lower kinetic energy, but added to a negative potential energy (that equals in absolute terms two times this kinetic energy) results in a total energy that is less negative.
Seemingly that is qualified as higher energy. A most absurd argumentation.

There is another situation that might have plaid a role in the misconception about potential energy. For the ease of the following consideration C/r will be called absolute potential energy. That situation concerns the also called potential energy of a mass m at height h with respect to earth's surface, well known as mgh, with $g = G.M_{earth}/r_e^2$ or $G.M/r_e^2$ and r_e the distance between *the centres* of both masses. Conclusion: the larger h the higher the related so called potential energy, fully in accordance with the misconception about absolute potential energy.
However, mgh is not an absolute but a relative potential energy, as difference between two absolute ones. The two absolute ones are: $E_{ph} = GMm/(r_e+h)$ and $E_{p0} = GMm/r_e$.
Normally $h << r_e$, so $E_{ph} \approx GMm*(r_e - h)/r_e^2 = E_{p0} - GMmh/r_e^2 = E_{p0} - mgh$.
So $E_{ph} - E_{p0} = -mgh$, or $E_{p0} - E_{ph} = mgh$. Indeed the absolute potential energy E_{p0} is larger than E_{ph}.

Again a result that easily can, and seemingly did, enhance the confusion about potential energy, as well as regarding its sign, its absolute value as its relation to the distance r, respectively h.

The deceased scientists who have not solved this problem properly are therefor excused.

As a result of this misconception the text below, copied from Wikipedia, has been generally accepted and has led to the wish to look for a better atomic model than the one of Bohr.
The wrong words have been crossed out and replaced by the correct ones.
"Orbital energy
In atoms with a single electron ....., the energy of an orbital ..... is determined exclusively by n. The n=1 orbital has the ~~lowest~~ *highest* possible energy in the atom. Each successively higher value of n has a ~~higher~~ *lower* level of energy, but the difference decreases as n increases. For high n, the level of energy becomes so ~~high~~ *low* that the electron can easily escape from the atom."

Especially the last sentence makes sense, after the correction, because it is well known that the atoms of conductive materials have so called valence electrons in the most outer orbits, which "can easily escape from the atom." Sure thing, the higher the energy of an orbiting object the more energy it needs to get it out of its orbit. Or the other way round: imagine a planet at a very large distance from the sun. You only have to blow to get it out of its orbit.

Reference [2]: "Why a Photon is not a Particle", describes in deep detail, based on Bohr's atomic model, how a photon is generated. The energy sources and changes are summarized below.

The energy of an emitted photon equals the change in kinetic energy of an electron jumping from an inner to an outer orbit. The first impression is that after such an emission the description of the energy exchange between the atom and its environment is completed. However this description is not complete at all.

In an orbital configuration, only based on gravitational forces, where an orbiting mass is forced to a larger orbit, the total loss of energy in such a system equals $\Delta E_p + \Delta E_k = 3\Delta E_k$ and concerns only *mechanical* energy, because there is no other source of energy in such a system.

If in such a system the orbiting mass is forced to an inner orbit, by definition by the environment, this system itself gains energy. This energy is delivered by the environment, because it carried out work to do so. If the environment carries out work to force this mass to an outer orbit, the system looses energy and it is tempting to simply argue that this energy is absorbed by the environment. However the environment carried out work to do so, thus must have *lost* instead of gained energy. The solution to this apparent contradiction is that the environment necessarily did already have an energy relation with the system before it could apply its force to it. Just like it also had in the first mentioned situation. The modelling of such an interaction requires at least a detailed knowledge of the specific interaction. But, at the end of the day we don't need to model such an interaction, because only the final result regarding the system under consideration is relevant. The physical law of conversation of energy tells us that energy cannot be lost or gained, but only transferred.

In the orbital configuration of an electron in an atom the total loss of *mechanical* energy of the atom also equals $3\Delta E_k$. But besides that it also looses an amount of energy equal to ΔE_k, taken away by the energy of the emitted photon.
Reference [2] shows that this energy is delivered by the magnetic energy of the atom, generated by the orbiting electron. An orbiting electron is equivalent to a rotating electric current that creates a magnetic field inside the area of such a current.

Finally: what happens if the environment forces an electron to jump to an inner orbit?
The related atom will gain mechanical as well as magnetic energy in such a situation. However the presented model assumes the generation of a photon if a magnetic field, created by such an orbiting electron, *suddenly* changes. Indeed, the word "suddenly" is of crucial importance!

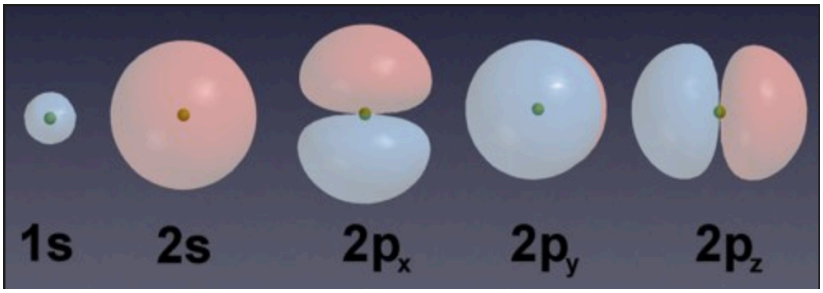
The problems that arose with this atomic model, most likely indirectly as a result of the mentioned misconception, were tried to eliminate with "refined" models!

Heisenberg-Schrödinger model
Copied from: http://www.abcte.org/files/previews/chemistry/s1_p6.html
"In 1926 Erwin **Schrödinger**, an Austrian physicist, took the Bohr atom model one step further. Schrödinger used mathematical equations to describe the likelihood of finding an electron in a certain position. This atomic model is known as the quantum mechanical model of the atom. Unlike the Bohr model, the quantum mechanical model does not define the exact path of an electron, but rather, predicts the odds of the location of the electron. This model can be portrayed as a nucleus surrounded by an electron cloud. Where the cloud is most dense, the probability of finding the electron is greatest, and conversely, the electron is less likely to be in a less dense area of the cloud. Thus, this model introduced the concept of sub-energy levels."

Copied from:https://the-history-of-the-atom.wikispaces.com/Werner+Heisenberg
"One of his most memorable discoveries of **Heisenberg** is the Uncertainty Principle. He said this means that electrons do NOT travel in neat orbits. Also, all electrons that contain photons will then change momentum and physics.
Heisenberg 's contribution to the atomic theory was that he calculated the behaviour of electrons, and subatomic particles that also make up an atom. Instead of focusing mainly on scientific terms, this idea brought mathematics more into understanding the patterns of an atom's electrons. Heisenberg 's discovery helped clarify the modern view of the atom because scientists can compare the actually few numbers of atoms there are, by their movements of electrons, and how many electrons an atom contains. Surrounding the outside of an atomic nucleus is an electron cloud, which is a name given to the electrons that are widely spreading and moving around. In conclusion, Heisenberg contributed to the atomic theory by including quantum mechanics, the branch of mechanics, based on quantum theory, used for interpreting the behaviour of elementary particles and atoms."

That appears like the argumentation has been: the more vagueness the better the understanding!

A picture of the related electron configuration, copied from Internet, is shown below.



The shapes of the electron clouds give the impression that electrons can also move right through the nucleus!
Or, expressed in terms applied to describe this H-S atomic model: the H-S model also "predicts the odds that the location of the electron" is inside the nucleus.

Notwithstanding the minimum chance that such a model has anything to do with reality, it will nevertheless be further analysed on the basis of the corresponding electron configuration.

Electron configuration
The "modern" electron configuration has an intricate patron, but the basic idea is still the one used in the R-B model [3]:

> "Each shell can contain only a fixed number of electrons. The general formula is that the n^{th} shell can in principle hold up to $2(n^2)$ electrons."

However, these shells itself have been divided into subshells in the H-S model, making the configuration exceedingly complex:

> "Each shell is composed of one or more subshells called s, p, d and f, which are themselves composed of atomic orbitals."

The following very principle questions now arise:
- How can an electron orbit (inside these shells) if there is no proton in these shells?
- Why have these sub-shells, with these magically orbiting electrons, been introduced?
- What kind of problem do these sub-shells solve?
- If the first shell has only one sub-shell, why has that sub-shell been introduced?
- What do the electrons in this first shell in the H and He atom, besides just orbiting the nucleus?
- Or don't they just orbit the nucleus?

An answer to the question: "What kind of problem do these sub-shells solve?" might be:

Hide the problem of the energy levels in the atomic model.

Wave–particle duality
This duality plays a big role in the creation of quantum physics.
Reference [4] writes:

> "Wave–particle duality is the concept in quantum mechanics that every particle or quantic entity may be partly described in terms not only of particles, but also of waves. It expresses the inability of the classical concepts "particle" or "wave" to fully describe the behaviour of quantum-scale objects. As Albert Einstein wrote:
> It seems as though we must use sometimes the one theory and sometimes the other, while at times we may use either. We are faced with a new kind of difficulty. We have two contradictory pictures of reality; separately neither of them fully explains the phenomena of light, but together they do."

Einstein introduced the "particle-wave-duality" that later has been upgraded to a kind of theory. The weirdest result of that "theory" is the idea that an electron is not only a particle, but also a wave. Whatever that physically may mean.

QED model
Copied from: http://cronodon.com/Atomic/AtomTech2.html
"Quantum electrodynamics (QED) is a theory which deals with the quantisation of the electro-magnetic field, rather than focusing on individual particles in isolation, and this predicts several corrections to the *electron energy*.

Comment:
This model is created while the phenomenon *electron energy* was, and is still, fundamentally misunderstood!

Notwithstanding these most exotic models the reference hereafter shows a list of at least 100 unsolved problems in physics, "grouped into broad areas of physics."
https://en.wikipedia.org/wiki/List_of_unsolved_problems_in_physics

Or would the formulation "*as a result of* these most exotic models" be more appropriate?

Conclusion

1 It is considered outstanding surprising that the misconception regarding the phenomenon "potential energy" most likely has led to the rejection of the Rutherford-Bohr model and to the creation of the Heisenberg-Schrödinger model, creating many more unsolved physical problems than solutions.
2 With the Rutherford-Bohr model and the correct calculation of potential energy, the generation of a photon can perfectly modelled, without applying any kind of quantum physics.
3 The general comment on [2]: "Why a Photon is not a Particle" is:
Not valid, because it doesn't use the QED model of the atom!
The question is: How to break through this circle argumentation?
The answer is: Repair the wrong definition of potential energy into the correct one.

Encore

Quote:
Wave–particle duality is the concept in quantum mechanics that every particle or quantic entity may be partly described in terms not only of particles, but also of waves. It expresses the inability of the classical concepts "particle" or "wave" to fully describe the behaviour of quantum-scale objects.
Unquote

When a phenomenon is "explained" by a duality or paradox, the reality is that such a phenomenon is not understood and thus cannot be modelled. Upgrading such a duality or paradox to a "theory" is almost the worst a scientist can do. The worst he can do is to apply such ignorance to a well-understood phenomenon (for example: an electron is an electric charged real particle) and come up with a phenomenon that doesn't make sense at all.

Physical science should not accept judgements like duality and paradox, but solve them without switching to magic physics.

References

[1] Conventional Definition of Potential Energy is Controversial http://vixra.org/pdf/1709.0440v1.pdf
[2] Why a Photon is not a Particle http://vixra.org/pdf/1505.0225v5.pdf
[3] https://en.wikipedia.org/wiki/Electron_shell
[4] https://en.wikipedia.org/wiki/Wave%E2%80%93particle_duality