

# Falsification of the Atomic Model

Johannes Maria Frank

[jmfrank63@gmail.com](mailto:jmfrank63@gmail.com)

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## Abstract

A mathematical proof is presented showing that the contemporary, widely accepted model of the atom must be false. In particular, the charge distribution of separated charges violates Gauss's law. It is further shown, that quantum mechanics cannot be used as an excuse for this impossible object to exist. Then a major flaw in the Rutherford gold foil experiment is discussed. Finally, the conclusion is drawn, that there cannot be an atomic nucleus and that the charges and thus the mass must be somehow more equally distributed across the volume of the atom.

## The Current Model

The current accepted model of the structure of the atom is the electron cloud model. It retains its basic traits and ideas from its predecessors, the Bohr, the Rutherford model and the Plum pudding model.

All of these historic models had mostly stability problems. They could be divided in problems of the stability of the shell and stability of the nucleus. The shell evolved over planetary paths to postulated fixed paths with quantum energy levels to the electron cloud governed by the Schrödinger wave function. The nucleus evolved from the assumption of stability through addition of neutrons. The early history is nicely described in "The History of Early Nuclear Physics". [1] In the 1960s and 70s, the quarks and the postulation of the strong force established the current theory.

The model is currently widely accepted. It states that the nucleus is governed by the strong force that the quarks exert on each other, which keeps the protons and the neutrons in the nucleus. The shell is governed by the Schrödinger equation, which state the probability that an electron is found in the shell. The various solutions lead to the orbitals, which is the set of all non-zero probabilities for each solution of the Schrödinger equation. The mathematics behind this model is very complex. You can easily write a 200 plus pages book on the matter. [2]

Yet, complex mathematics is only valid, if the assumption it is based upon is correct. It will be shown here, that the underlying assumption and thus all conclusions from it is false.

## Doubts

The mass distribution alone should already rise suspicion. Almost all the mass is centred in the nucleus, so how is the shell moving this mass in case of a collision? Is inertia suddenly non-existent? How is any impulse transferred across an atom?

Moreover, in physics, we rely upon the fact that a structure uniquely defines its behaviour and vice versa. Any reflection measurement is only possible because of this fact. But we seem to ignore that our solar system, which has a very similar mass distribution, has an entirely different structure. Why does one result in a disc like structure, while the other one ends up to be a sphere like one? While these arguments are already strong arguments against the model, they are not the centre of the falsification here.

The falsification focuses on the charges. It will, of course, be futile to point out, that putting likewise charges into a nucleus, the nucleus should simply explode. Yet, the strong force has explained this otherwise impossible construction.

The argument that is presented here is, that a charge-separated structure is a dipole, and this dipole is both impossible to build and unstable if assumed existent.

## Falsification

According to the model, the charges are separated. One type is in the nucleus, the other in the shell. For baryonic matter, the nucleus is the positive part, and for simplicity reasons is the only one considered here. For an inversion of the charges, the same argument applies, so it will be valid for any anti-matter atom as well.

The separation of the charges turns the atom into a dipole, the shell is one pole and the nucleus the other. However, it is a dipole that cannot exist. It is simply impossible to build an atom this way, as it violates Gauss's law.

The law states, that the flux through any enclosing surface of an atom must be zero.

$$\oint_S E_n dA = \frac{1}{\epsilon_0} Q_{inside} \quad (1)$$

Since field lines are continuous and because atoms are neutral, to fulfil the law, the field lines from the nucleus have to somehow have an uninterrupted path from the nucleus all the way to the outside of our test surface. However pathologic you assume these lines, the Jordan curve theorem states that they divide the area, which the curve runs through, into two parts. Though atoms are spheres, it will suffice to look at a plane only, for if a plane is non-existent, then the sphere build up of those planes is non-existent, too.

A two-dimensional simulation of how this looks like is given in figure 1. The simulation has been done in Matlab, but can be run in Octave as well. The code is given at the end of the article. For simplicity reasons, all negative charges have been placed at the same distance.

To be sure, the calculations are correct, and the equidistant charges do not affect the radiation of positive field lines to the outside, another program has been used to calculate a symbolic Neon atom2. The code is available on GitHub [3]. It can be clearly seen that the field lines from the nucleus have a direct path to the outside. Gauss's law is fulfilled.

The field lines create a funnel towards the nucleus. One simulation assumes all negative charges equally distant to the nucleus and to each other; The other simulates somehow the idea of Bohr of fixed sized orbits. In however way you distribute the charges, as long as you do not close the outer sphere, any charge distribution will exhibit uninterrupted field lines from the nucleus to the outside. In that case, no path to the outside would exist, and the field lines could not reach the outer region. But now Gauss's law would be violated, as a neutral object would appear to be negatively charged. Thus, continuous paths from the inside to the outside must be present. It should be clear that such a construction is not stable. Besides the fact that rotation of the negative charges has already been ruled out before because of radiation energy losses, the positive field line barriers prevent rotation as well. Additionally, and this is more important, they also prevent any kind of oscillation, which would be necessary for a wave function to exist. Without any rotation or oscillation, the atom should simply implode. Since atoms do not implode, the model must be wrong.

It might be pointed out, that "no oscillation" is not completely right. Longitudinal waves could still be possible, as well as transversal, with a maximum amplitude of the radius of the nucleus, as the field lines prevent any larger standing wave. But electromagnetic waves are always TEM-waves, and a maximum amplitude of the radius of the nucleus will never lead to a solution of the Schrödinger equation. Therefore, without the possibility of oscillation, the wave function is impossible to solve. Ergo, quantum mechanics will not save the model.

Though the above should be a valid argumentation, we might want to have a closer look at quantum mechanics as a safe haven for the atomic model. In classical mechanics, we can definitely conclude, that such a structure cannot exist. Can something that is impossible in the macroscopic world turn

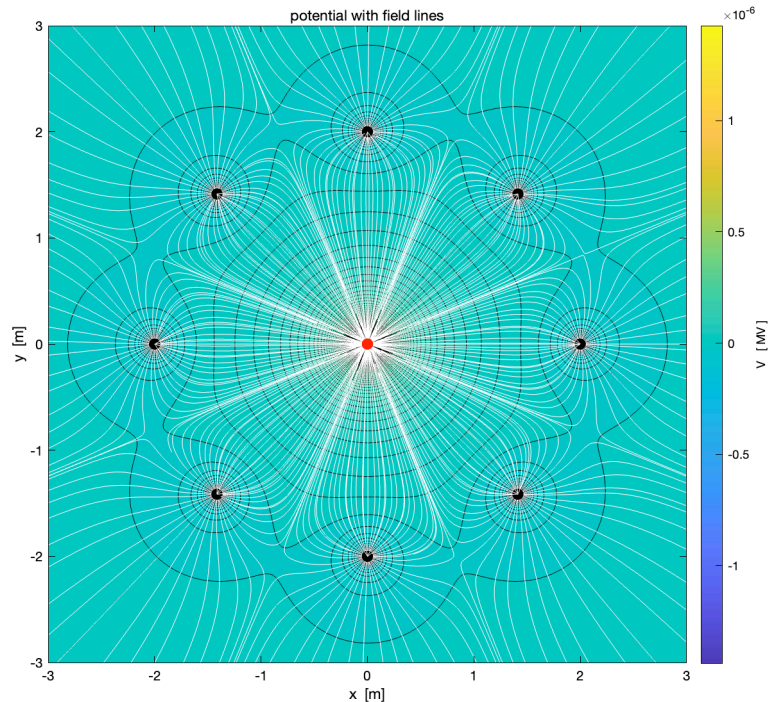


Figure 1: Symbolic Oxygen Atom

into existence by quantum mechanics?

The most prominent example of this might be the quantum tunnelling effect. Something that is not possible in classical mechanics is possible in quantum mechanics. But if you look closer, quantum mechanics does not turn the transition of a barrier from impossible into possible. The difference is only energy. You can tunnel in classical mechanics, meaning you can pass the potential barrier, provided you use energy, while in quantum mechanics you don't (or need less).

Quantum mechanics is said to be hard to understand. Yet, it might not be that hard, except you abuse it to explain impossible objects to be existent. That will badly fire back on the ability to make sense of quantum mechanics.

With all of the above, it is clear: Atoms cannot have a structure with separated charges. The conclusion we can draw then, since there is no third alternative, is that the charges must be equally distributed across the volume of the atom. However, this presents two new problems. Earnshaw's theorem and Rutherford's gold foil experiment. Earnshaw's theorem will not be discussed here, as it only presents problems with alternative models, and they are not part of the discussion here. But how do we deal with the Rutherford gold foil experiment, which clearly seems to show the existence of a nucleus?

## The conflict with the Rutherford experiment

Rutherford's experiment clearly seems to contradict the above. Therefore, the experiment will have to be closely examined. First, the 1911 publication is simply invalid, for Rutherford and whoever peer reviewed this paper (they are actually more to blame!), made a basic mistake.

The exact point of the mistake is this sentence: [4]

Consider an atom which contains a charge  $\pm Ne$  at its centre surrounded by a sphere of electrification containing a charge  $\pm Ne$  [N.B. in the original publication, the second plus/minus sign is inverted to be a minus/plus sign] supposed uniformly distributed

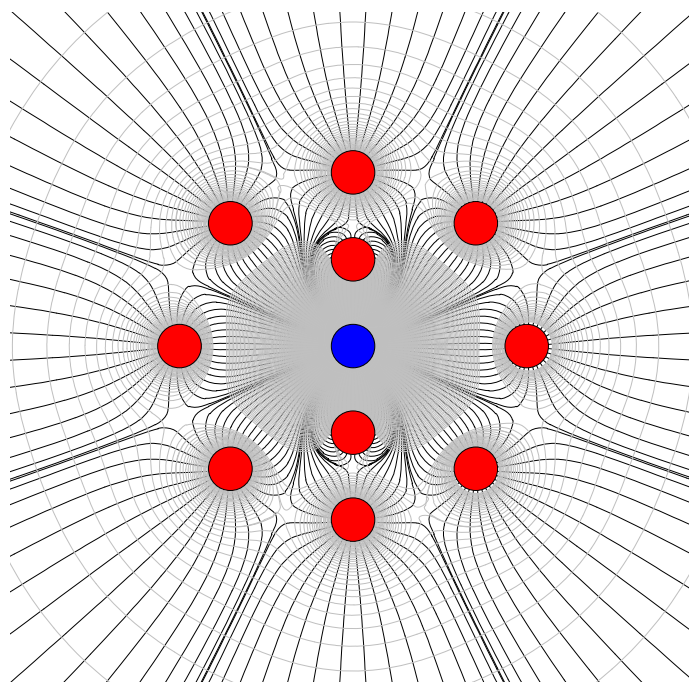


Figure 2: Symbolic Neon Atom

throughout a sphere of radius  $R$ .

This is simply an invalid assumption, for the negative charges cannot uniformly surround the positive ones. The mathematics he pulls off is pretty cool, nevertheless, from false follows true, on an invalid assumption, you can conclude anything. Thus, the theoretical conclusions are simply invalid.

However, the results still stand and seem to be rock solid. But are they really rock solid? One natural question to ask, has there been some error in the measurement. The experiment was done 111 years ago, so it might have succumbed to some effects like background radiation or similar. I know it seems heretic to ask this question, Rutherford, Geiger, and Marsden were real professionals and excellent physicists, yet in a thorough reassessment this question has to be asked.

Without redoing the experiment, it can, however, be concluded that the measurement is absolutely correct, for the simple reason, that you can buy the experiment off the shelf. It is part of the undergraduate physics education and is conducted several thousand times a year. Modern sets have lead glass and are well protected against any kind of stray radiation, and the results are confirmed. Therefore, the measurement results are beyond any doubt.

With the results undoubtedly confirmed, where else could there be a mistake? Surprisingly, there is a vital flaw in the experiment, a flaw that is still existent in the modern version of the experiment. The flaw lies in the way the measurement is done. The particles are not directly measured, but indirectly via ionization. This is how scintillation screens work (they were used by Geiger and Marsden in the original experiment) and this is how Geiger-Muller counters work (used in modern versions).

If we are measuring ionization, how do we know we are measuring alpha particles? We don't! Neither charge nor type of particle can directly be determined. This measurement interpretation to be because of alpha particles is a pure assumption. What else could there be, we are shooting alpha particles, we protected against outer radiation, so it can only be alpha particles, right? Rutherford himself said:

It was quite the most incredible event that has ever happened to me in my life. It was almost as incredible as if you fired a 15-inch shell at a piece of tissue paper, and it came back and hit you.

In reality, 15-inch shells do not come back when shot at a sheet of tissue paper. What could come

back, however, is a piece of tissue paper, (We are under vacuum, so pieces of tissue paper fly like bullets).

Just as a 15-inch shell doesn't come back, the alpha particle most likely shouldn't either. But our detector won't tell us whether this particle is an alpha particle or something else. Neither did the scintillation screen back in 1911.

However, this debate is easily settled, once an electric field is put in front of the detector, similarly as J.J. Thomson did, when discovering the electron. With the additional field, both charge and mass and thus the type of the particle measured could be determined without any uncertainty.

Unfortunately, so far, the attempt to persuade several scientists to redo the experiment with an electric field failed, as nobody was interested. So, we have to await any results with an additional field, (or any equivalent measure, to ensure the type of particle is uniquely determined). The detector alone won't do it.

The expectations are that the reflected particles are not alpha particles, but most likely electrons or occasionally positrons (these are the only light particles that come out of atoms). Independent of the outcome, the separated charges of the inner structure of the atom will still be impossible, and thus the search for the structure of the atom is open again.

## References

- [1] M. Mladjenovic, *History Of Early Nuclear Physics, Vol I (1896-1931): Radioactivity And Its Radiations*. World Scientific Publishing Company, 1992.
- [2] J. A. Pople and D. L. Beveridge, "Molecular orbital theory," *CO.*, NY, 1970.
- [3] Adrian Roman, "Electric field simulator," 2022, <https://github.com/aromanro/ElectricField>, last access 27.08.2022.
- [4] E. Rutherford, "Lxxix. the scattering of  $\alpha$  and  $\beta$  particles by matter and the structure of the atom," *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, vol. 21, no. 125, pp. 669–688, 1911.

## Code

```
% SymbolicOxygen.m
% August 2022
% Johannes Maria Frank jmfrank63@gmail.com
% Based on
% Ian Cooper
% School of Physics, University of Sydney
% https://d-arora.github.io/Doing-Physics-With-Matlab/
% Symbolic Oxygen Atom showing the impossibility of a closed outer shell
close all
clc
tic
% INPUTS =====
% Number of grid point      [N = 10001]
    N = 2993;
% Number of charges
    n = 8;
% Number of field line calculation on a full angle (360)
    m = 45;
% Charge Q = [10, 0, 0, 0, 0]
    Q = [ones(1,n), -n] .* -1.6e-19;
% Radius of circular charged conductor;
    a = 1e-12;
    r = 50e-12;
    d = 1.5*r;
    th = linspace(0, (n-1)*2*pi/n, n);
% X & Y components of position of charges [0, 0, 0, 0, 0]
    xC = [r.*cos(th), 0];
    yC = [r.*sin(th), 0];
% 5 random charges  uncomment to run the program for 5 random charges
%   Q = (1 + 9 .* rand(5,1)) .* 1e-6;
%   xC = -2 + 4 .* rand(5,1);
%   yC = -2 + 4 .* rand(5,1);
% constants
    eps0 = 8.854e-12;
    kC = 1/(4*pi*eps0);
% Dimensions of region / saturation levels
%   [dimensions of region -2 to 2 / minR = 1e-6 / Esat = 1e6 / Vsat = 1e6]
    minX = -d;
    maxX = d;
    minY = -d;
    maxY = d;
    minR = 1e-6;
    minRx = 1e-6;
    minRy = 1e-6;
    Vsat = kC * max(abs(Q)) / a;
    Esat = kC * max(abs(Q)) / a^2;
% SETUP =====
% fields
    V = zeros(N,N);
    Ex = zeros(N,N); Ey = zeros(N,N);
% [2D] region
    x = linspace(minX, maxX, N);
```

```

    y = linspace(minY, maxY, N);
    % color of charged object + red / - black
    col1 = [1 0 0];
    col2 = [0 0 0];
    [xG, yG] = meshgrid(x,y);
% CALCULATION: POTENTIAL & ELECTRIC FIELD =====
for i = 1 : length(Q)
    Rx = xG - xC(i);
    Ry = yG - yC(i);
    index = find(abs(Rx)+ abs(Ry) == 0);
    Rx(index) = minRx; Ry(index) = minRy;
    R = sqrt(Rx.^2 + Ry.^2);
    R(R==0) = minR;
    V = V + kC .* Q(i) ./ (R);
    R3 = R.^3;
    Ex = Ex + kC .* Q(i) .* Rx ./ R3;
    Ey = Ey + kC .* Q(i) .* Ry ./ R3;
end
if max(max(V)) >= Vsat; V(V > Vsat) = Vsat; end
if min(min(V)) <= -Vsat; V(V < -Vsat) = -Vsat; end
E = sqrt(Ex.^2 + Ey.^2);
if max(max(E)) >= Esat; E(E > Esat) = Esat; end
if min(min(E)) <= -Esat; E(E < -Esat) = -Esat; end
if max(max(Ex)) >= Esat; Ex(Ex > Esat) = Esat; end
if min(min(Ex)) <= -Esat; Ex(Ex < -Esat) = -Esat; end
if max(max(Ey)) >= Esat; Ey(Ey > Esat) = Esat; end
if min(min(Ey)) <= -Esat; Ey(Ey < -Esat) = -Esat; end
% GRAPHICS =====
figure(1)
set(gcf,'units','normalized');
% Increase colours (last parameter) for more potential lines
contourf(xG,yG,V./1e12,256)
xlabel('x [m]'); ylabel('y [m]');
title('potential with field lines','fontweight','normal');
hold on
ang = linspace(0,360 - 360/m,m);
ang = deg2rad(ang);
for i = 1 : length(Q)
    % Charge # i
    if Q(i) > 0
        p3 = Ex; p4 = Ey;
    else
        p3 = -Ex; p4 = -Ey;
    end
    sx = xC(i) + a .* cos(ang .* (1 + 4*pi/m * (m-1)));
    sy = yC(i) + a .* sin(ang .* (1 + 4*pi/m * (m-1)));
    h = streamline(xG,yG,p3,p4,sx,sy);
    set(h,'linewidth',.1,'color',[1 1 1]);
    % charged conductors
    if Q(i) < 0
        col = col2;
    else
        col = col1;
    end
end

```

```

    pos = [-a+xC(i), -a+yC(i), 2*a, 2*a];
    h = rectangle('Position',pos,'Curvature',[1,1]);
    set(h,'FaceColor',col,'EdgeColor',col);
end
shading interp
% Exclude the next two lines for Octave
h = colorbar;
h.Label.String = 'V    [ MV ]';
beta = 0.5;
brighten(h,beta);
set(gca,'xLim',[minX,maxX]); set(gca,'yLim', [minY, maxY]);
axis square;
box on;
%%
toc

```