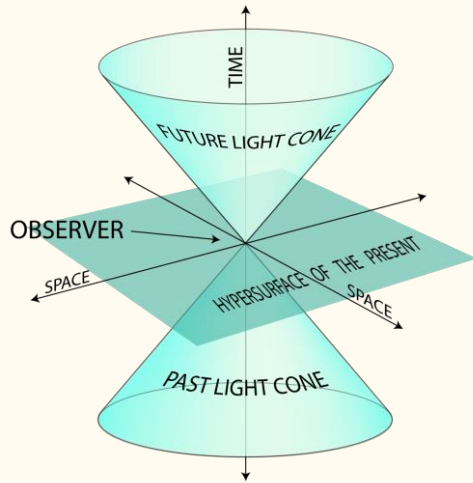# INTERACTING ELECTRON-PHOTON SYSTEM IN ONE SPACE DIMENSION

PROF. SHADI TAHVLIDAR-ZADEH
XIANGYUE WANG
ADRIANA SCANTEIANU
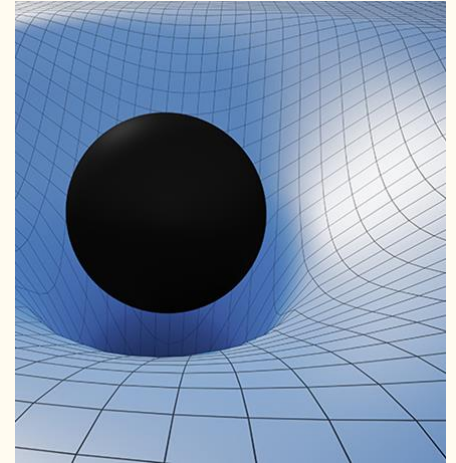
Special Relativity $+$ Quantum Mechanics

Special Relativity

Quantum Mechanics

(Gravity?)

The question we want to answer is the following:

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CAN WE COME UP WITH A PICTURE OF ONE DIMENSION PHOTON-ELECTRON COLLISION

The question we want to answer is the following:

THAT IS BOTH REALISTIC AND MATHEMATICALLY RIGOROUS?

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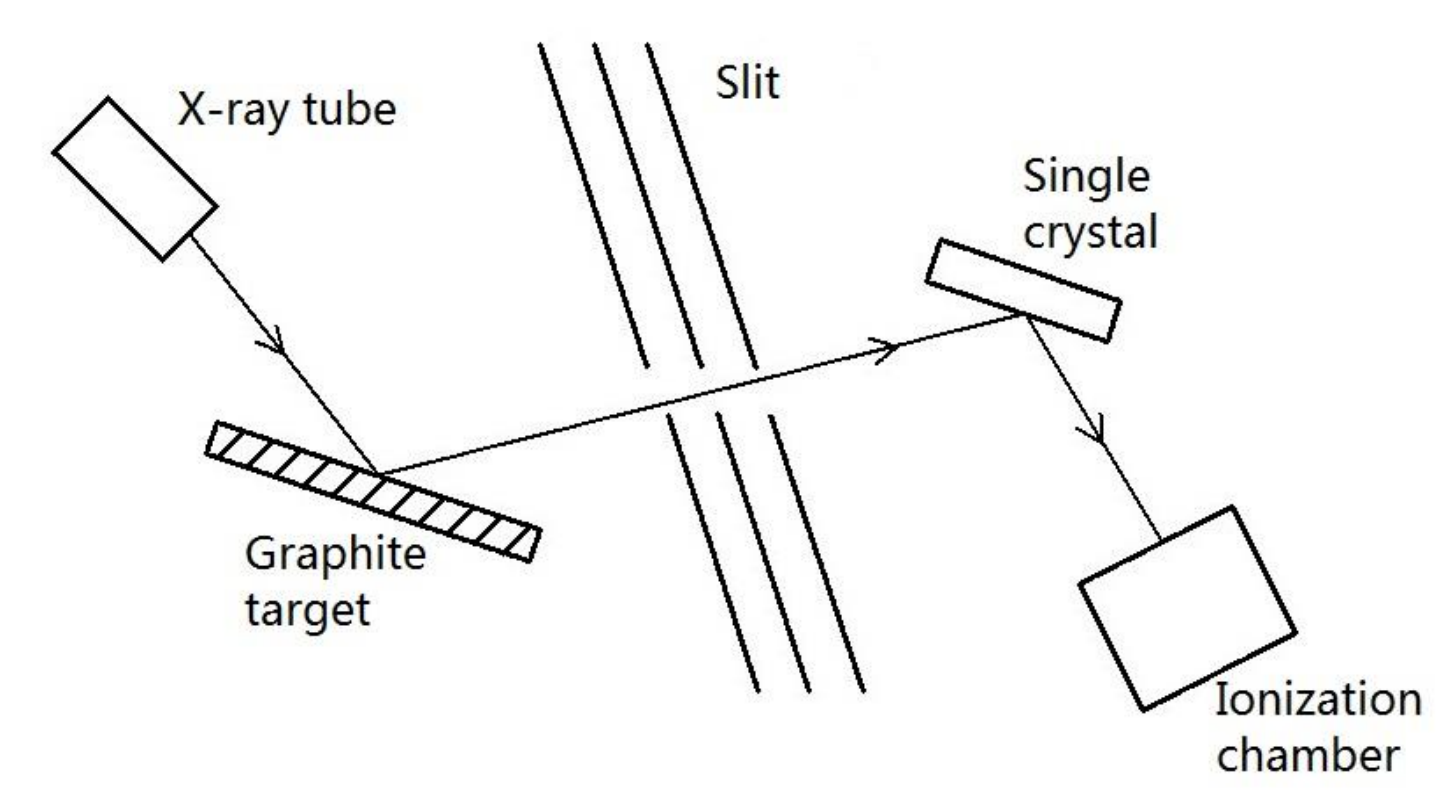
light behaves like...
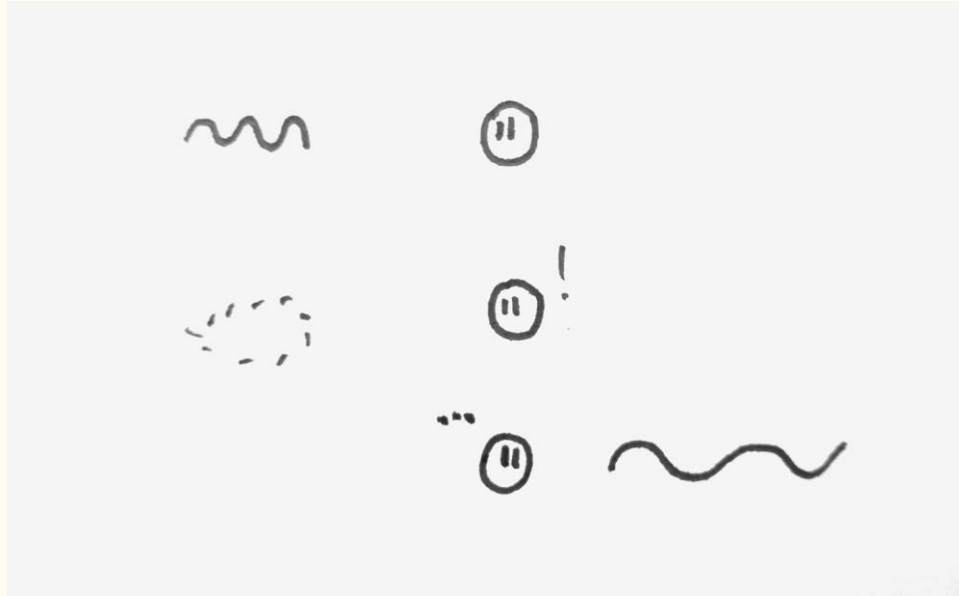
● ● ● ● ●

...a stream of particles.

This is how he found out:

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The picture Quantum Field Theory gives is the following:

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But not all physicists agree.

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"…the Compton effect, at its discovery, was regarded as a simple collision of two bodies, and yet the detailed discussion at the present time involves the idea of the annihilation of one photon and the simultaneous creation of one among an infinity of other possible ones. We would like to be able to treat the effect as a two-body problem, with the scattered photon regarded as the same individual as the incident, in just the way we treat of the collisions of electrons."

--C. G. Darwin *Notes on the Theory of Radiation*

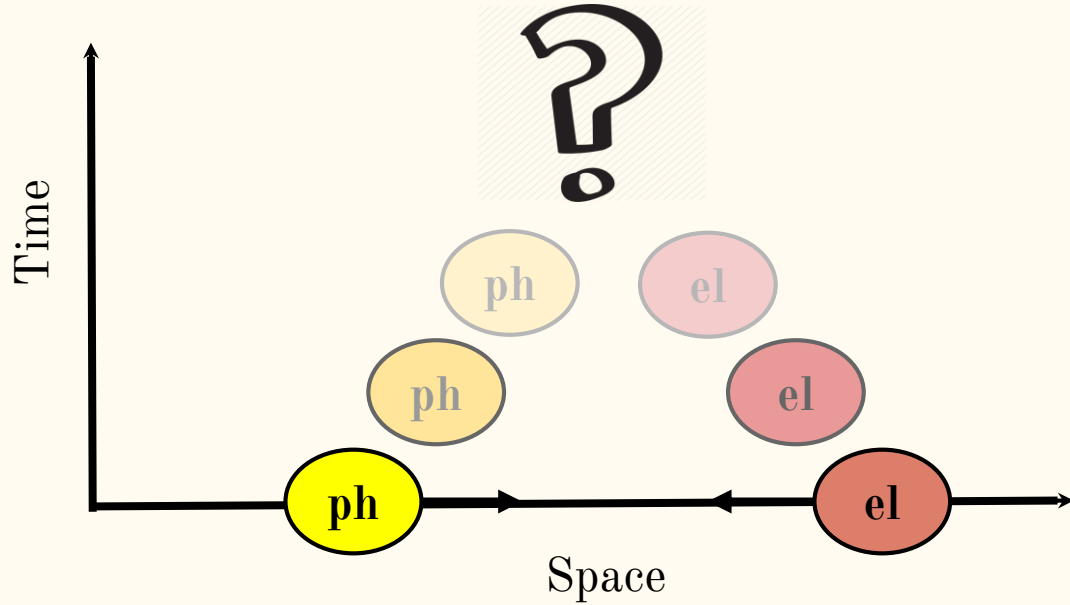Charles Galton Darwin
1887 - 1962
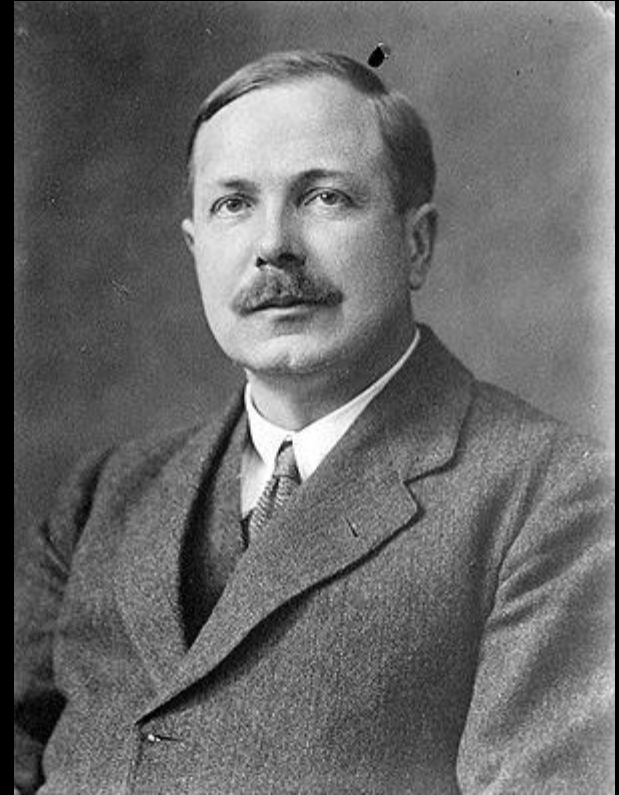
In short, we want to treat both electron and photon as quantum particles, their motion guided by a wave function defined on the 2-particle configuration space.

In other words, a description using relativistic Bohmian Mechanics.

A Quick Note on Bohmian Mechanics

1 Space Dim, 1 Time Dim, 1 Wave Function

Using Matlab, we will simulate the collision of photon and electron using a 2-particle relativistic multi-time wave equation, in one space dimension.

We hope this will bring us one step closer to understanding photon-electron interactions in a more realistic system.

Thank you to Professor Tahvildar-Zadeh and his work with Professor Kiessling.

IMAGE CREDITS

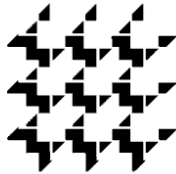https://www.aps.org/programs/outreach/history/historicsites/compton.cfm

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