FLIPCHART TWO

SESSION 2: THE AGE OF QUANTA

CLOUDS GATHER...

MATHEMATICS

PLANK INVENTS FORMULA WHICH WORKS...

$R_\lambda = \frac{c_1}{\lambda^5} \frac{1}{e^{c_2/\lambda T} - 1}$

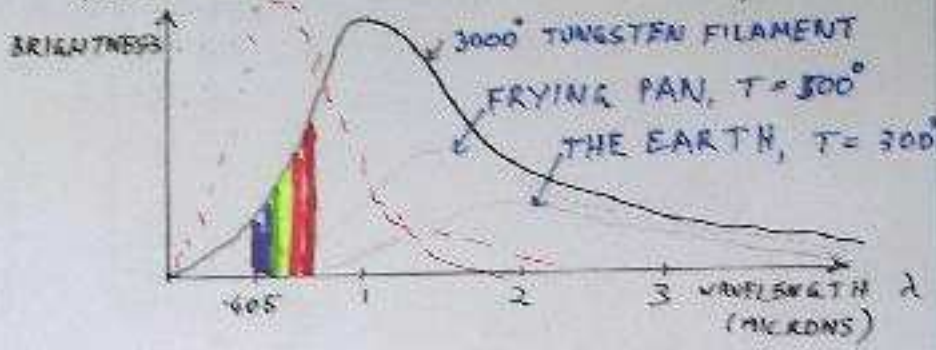
$c_1 \neq c_2$ ARE FUDGE FACTORS

$E = hf$

IMPOSSIBLE ATOM

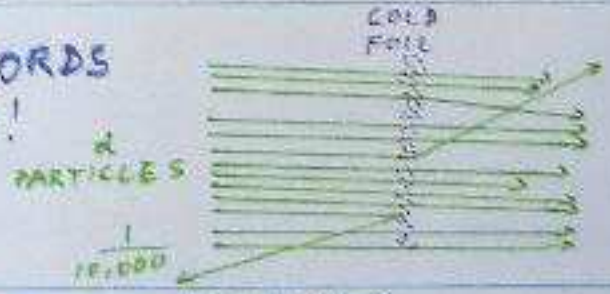
$\lambda = \frac{h}{p}$

PROFF PLANK TRIES TO DERIVE A FORMULA FOR LIGHT FROM HOT OBJECTS (LIKE LIGHT BULB FILAMENTS)



PLANK IS FORCED TO USE BOLTZMAN STATISTICS OF ELECTRON OSCILLATORS WITH ENERGIES hf, $2hf$, $3hf$. THE AGE OF QUANTA BEGINS.

RUTHERFORDS SURPISE!



BOHR'S CONVENIENT ASSUMPTION:

SPECIAL ORBITS ALOWED IF...

PRINCE DE-BROGLIE POSITS:

"IF LIGHT CAN BE A PARTICLE, PERHAPS AN ELECTRON CAN BE A WAVE!"

THEORY OF REALITY

ATOMS DONT REALLY EXIST JUST A CALCULATION TRICK CHEMISTS USE!

PLANK STILL THINKS LIGHT IS CONTINUOUS

ATOMS & QUANTA

SECOND SHEET

SESSION 26

BIG SUCCESS, BIG QUESTIONS

THE MATHS:

$\lambda = \frac{h}{p}$

PRINCE DE-BROGLIE VINDICATED:

ELECTRON DIFFRACTION OBSERVED.

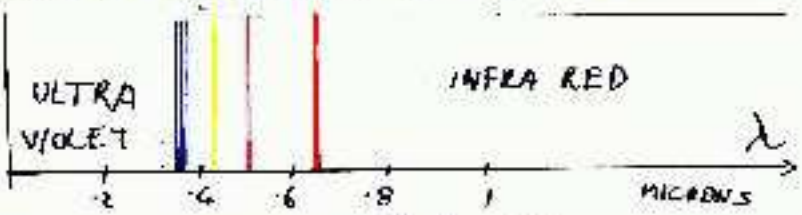
(55eV electrons reflected off Nickel at 50°)

ALSO THIS TIES IN WITH THE SPECIAL ORBITS OF ELECTRONS IN ATOMS AND A SURPRISING VICTORY....

REALITY THEORY

ATOMS RECEIVE & PRODUCE QUANTA OF LIGHT

THE BALMER SERIES - SPECIAL NUMBERS



SPECTRUM of HYDROGEN.

THE SHRÖDINGER EQUATION:

VERY NEAT FORMALISM

$\frac{-\hbar^2}{2m}\nabla^2\psi + V\psi = i\hbar\frac{\partial\psi}{\partial t}$

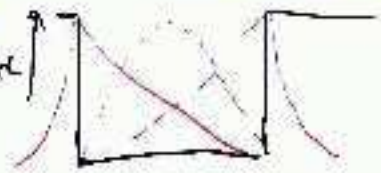
SPACE DISTRIBUTION — POTENTIAL ENERGY DISTRIBUTION — TIME VARIANCE

WAVE FUNCTION ψ

ψ IS A MATTER WAVE!

A WAVE OF EXISTENCE.

DEPENDING V ψ CAN BE A TRAVELLING WAVE PACKET OR AN ELECTRON SLOSHING ABOUT IN A POTENTIAL WELL - SEMICONDUCTOR HOLE, ATOM OR SOMEWHERE.



A STRANGE INTERPRETATION

ψ^2 AT A POINT IS A PROBABILITY.

ψ^2 IS THE PROBABILITY OF EXISTENCE OF FINDING A PARTICLE AT THAT POINT IF YOU LOOKED!

ψ^2 IS A PROBABILITY DISTRIBUTION

SESSION 2c
MORE CURIOUS . . .

$\Delta p \Delta x \geq \lambda$

1927 HEISENBURGH UNCERTAINTY PRINCIPLE:
THERE ARE COMPLEMENTARY ATTRIBUTES OF A PARTICLE WHICH CANT BOTH BE KNOWN.
eg MOMENTUM & POSITION.
THE MORE YOU SPECIFY ONE OF THESE THE LESS YOU CAN KNOW THE OTHER.

THEORY of REALITY

OUTCOMES OF EXPERIMENTS ARE UNPREDICTABLE.

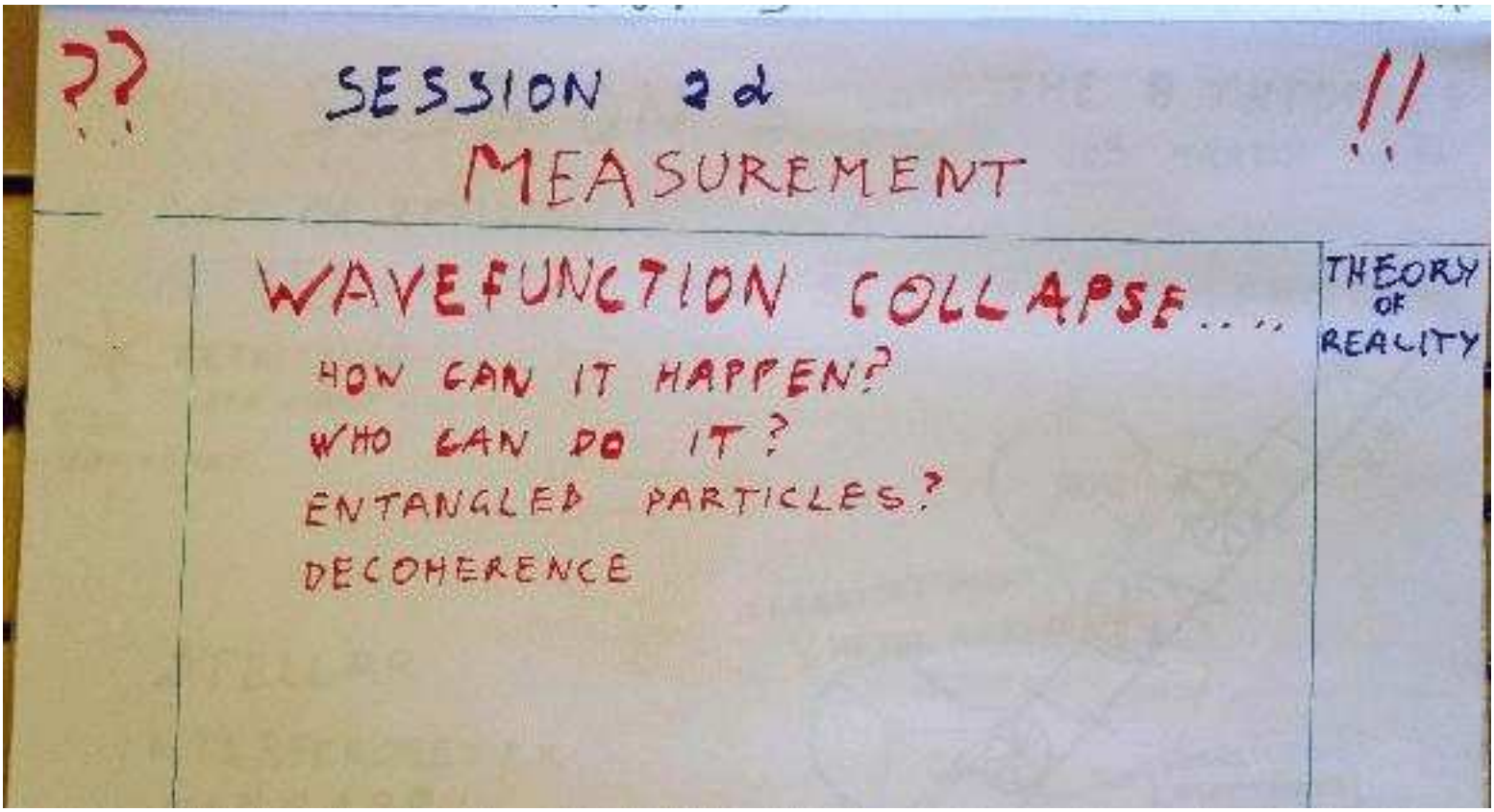
THEORY OF REALITY #1:
COPENHAGEN INTERPRETATION #1
(AFTER THE BOHR INSTITUTE OPENED 1921)
"YOU CANT PREDICT OUTCOMES, BUT YOU CAN PREDICT THE ODDS."

THEORY #2:
HEISENBURGH WENT FURTHER,
"THERE IS NO REALITY UNTIL YOU MEASURE IT"

OBSERVATION CREATES REALITY

THE END OF CAUSUALITY
THE "DISTURBANCE" INTERPRETATION OF THE UNCERTAINTY PRINCIPLE REJECTED
NO NEED FOR INTERPRETATION/
"JUST SHUT UP & CALCULATE!"

PAGE FOUR



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