

Quantum Physics, Video Games and STEM Education

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Fact: ...

The Evidence ...

What That Tells Us ...

A Second Fact ...

Hypothesis: ...

State of the Art

[variant:limits \(Calculus game from Texas A&M\)](#)

(Start at about 50 seconds)

"Players will see the subject come to life in a 3D environment where they must solve a series of increasingly challenging calculus problems in order to stop the geomagnetic storms threatening their planet's survival."

Verdict (?)

Devlin, "Math Education for a New Era", [paraphrased]:
"[I]n real life, you are rather unlikely to find yourself face-to-face with a billboard that has a calculus math problem written on it ... Symbolic expressions are how we do math when working with paper and pencil. They look out of place in a game world ... because they **are** out of place."

In Other Words ...

This Game is Just a More Engaging Version of
the Standard Approach ...

Does Not Help Students Develop
Situated Understanding

“Einstein’s Quest”
A video game by:
A. Post, J. Varghese, A. Chen and Neelam

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First, a bit of Quantum Mechanics

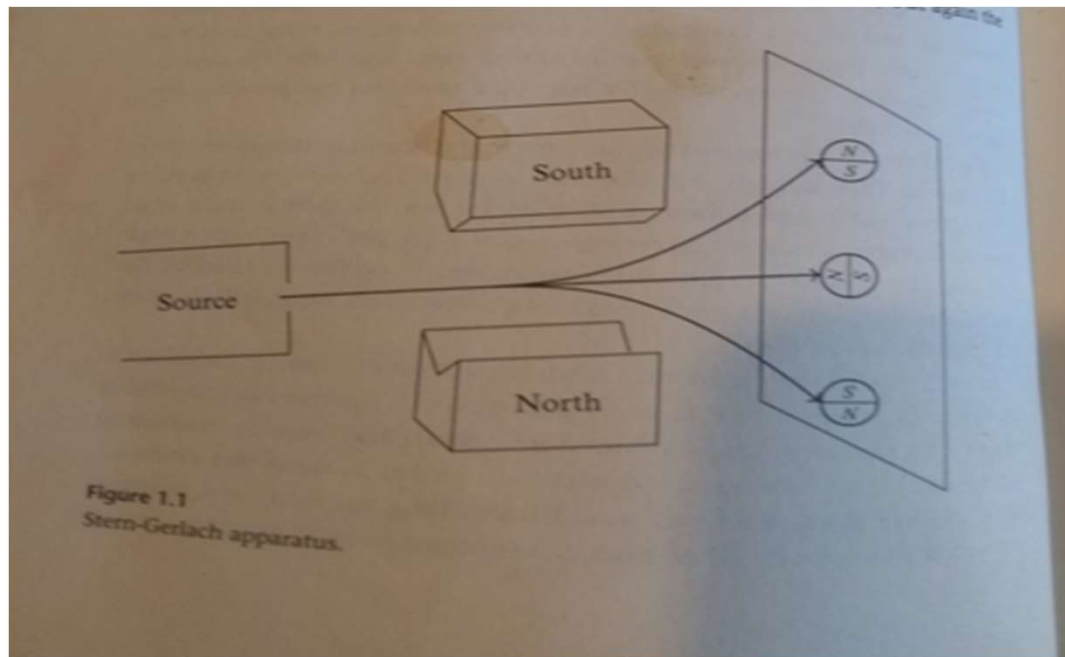
Three Key Ideas:

1. Superposition of States
2. Collapse of a superposed state upon observation
3. Entanglement of states (of two or more systems)

Books:

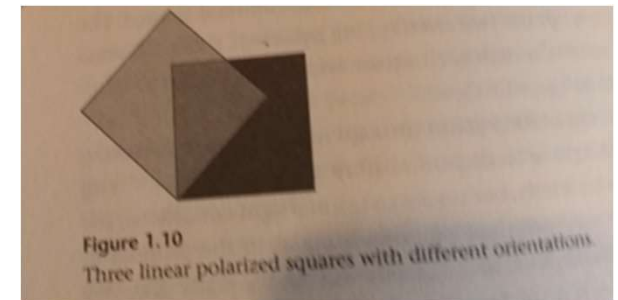
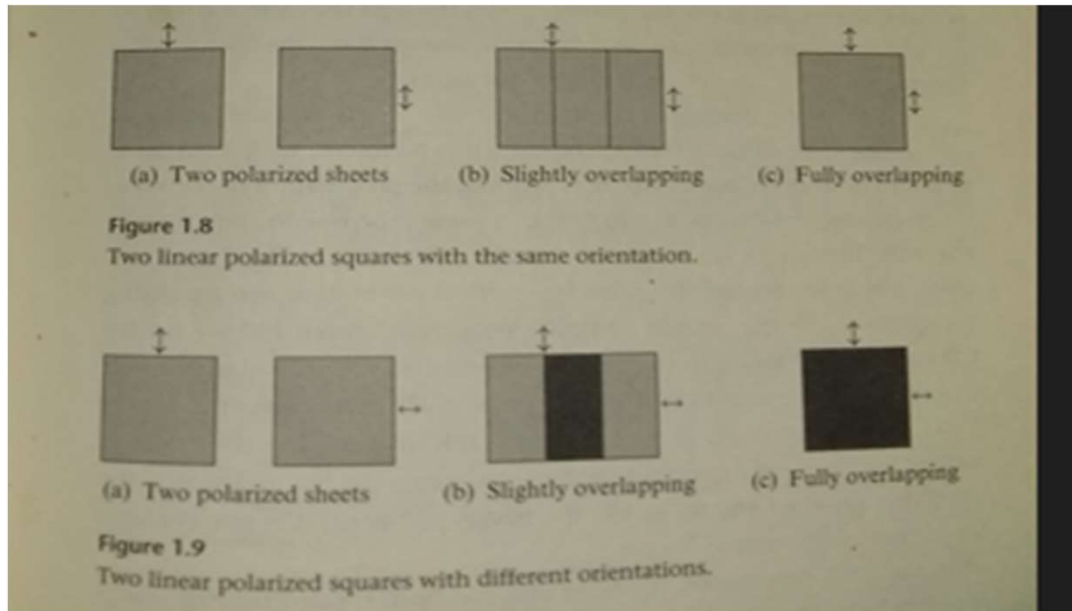
1. Quantum Computing for Everyone; Bernhard
2. Quantum Mechanics: The theoretical minimum; Susskind and Friedman
3. Principles of Quantum Mechanics; Dirac

Experimental Evidence (Stern & Gerlach)



Demo with
polarizing
filters?

What *Should* Have Happened in Demo



Einstein's Quest

Two sets of problems with the game:

- Game guidelines
(Engagement, Agency, ???)
- Physics problems

Conclusions:

- Gamification vs Simulation vs VGBL
- Game design/implementation is tough!
- But ...



I Hear and I Forget.
I See and I Remember.
I Do and I Understand.
I Play and It Becomes Part of Me