# Galton Board Double Slit Experiment

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## Abstract

We all know how successfully the classical Galton board's binomial distribution for large number of balls n, thrown sequentially (i.e. one ball at the time) approximates the normal statistical distribution (Gaussian curve) and therefore also classically emulates the Single-Slit single photon diffraction experiment. With a 50% chance it shows that a classical deterministic setup environment can emulate quantum randomness at the macroscopic size scale. But what about a modified Galton Board Double-slit sequential falling balls experiment? This experiment as far as we know was never demonstrated in the literature and carried out anywhere else. What will be the results if interference of the balls is allowed, will it emulate usefully the wave interference pattern-distribution we get with the quantum double slit photon or electron experiment? Even with time intervals between the balls falling sequentially set relative large each ball will cause vibrations across the Galton board that will feedback and alter possible the motion of the single ball. In that way the ball is effectively interfering with itself and therefore possible will emulate the self-interference of a double-slit single photon experiment. No one knows for sure unless this proposed experiment is carried out and the results are collected and analyzed.

## 1. The Proposed Experiment

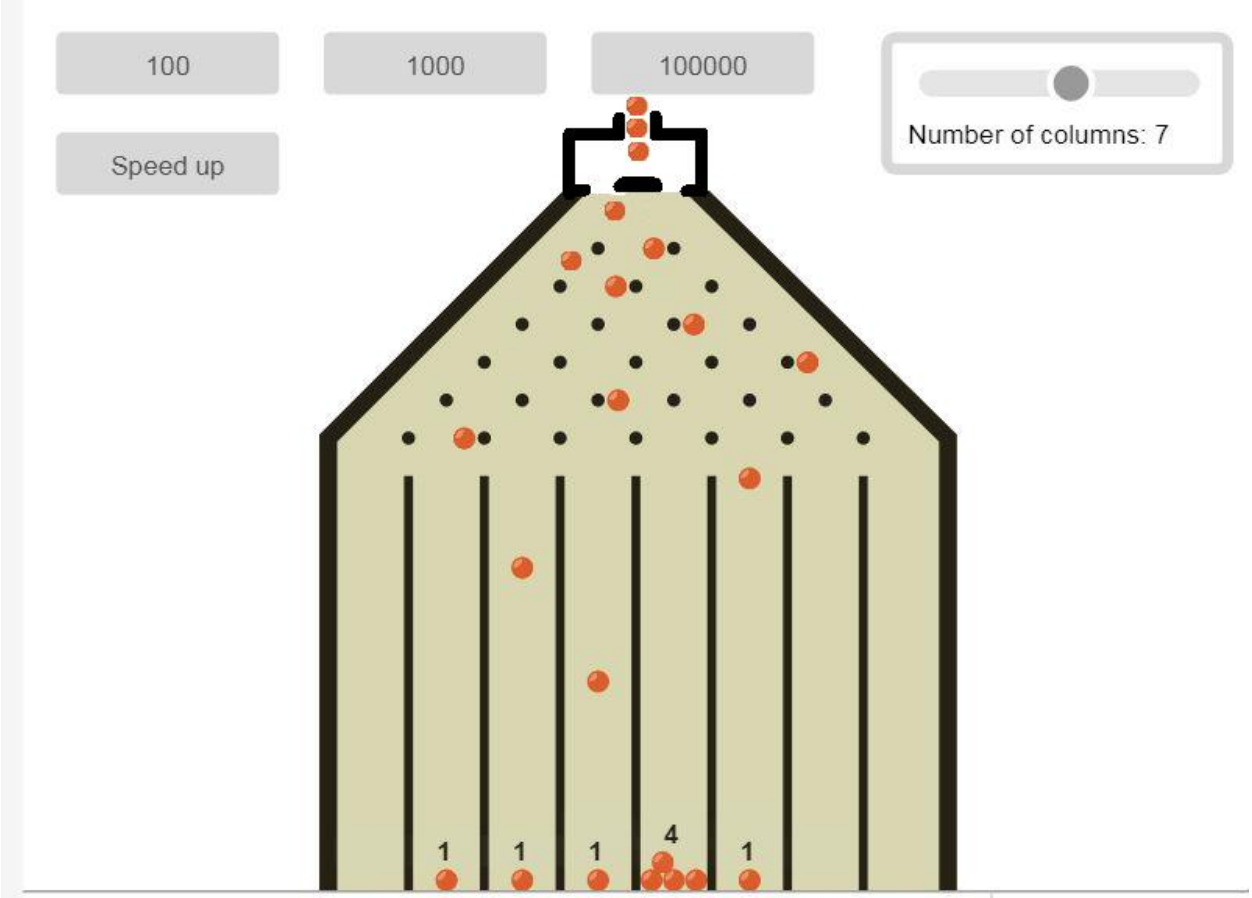


**Figure 1 The proposed modified Galton Board Double Slit experiment. Balls are falling sequentially one at the time through a double slit aperture and collected on the slots emulating the intensity of the fringes in the double-sling single photon interference quantum experiment. If statistically the two different experiments results match with each other or in good approximation, then this experiment will strongly infer and demonstrated macroscopically how quantum randomness is possible to originate from a deterministic system.**

In fig.1 the proposed modified Galton Board [1] experiment is shown it could be physically carried out (emulation) or algorithmically executed (simulation) with a 50% change set, a ball hitting a pin on the board going to the left or to the right. In the case of simulation of this experiment appropriate parameter values of the simulation should be set for the bouncing of the ball on a pin to approximate simulate the elastic scattering of the photons on electrons we have in the quantum case. However, the pins should transfer inelastically across the board to the other pins, vibrations resulting in micro tremors around their initial positions. The displacement amplitude of the vibrating pins on the board should be set up at 10% of the thickness of each pin and vibrations of each pin should be in all directions randomly.

The collected balls number distribution on slots at the end of the experiment should be analyzed to see if their match a wave interference pattern and fringes, see fig.2.

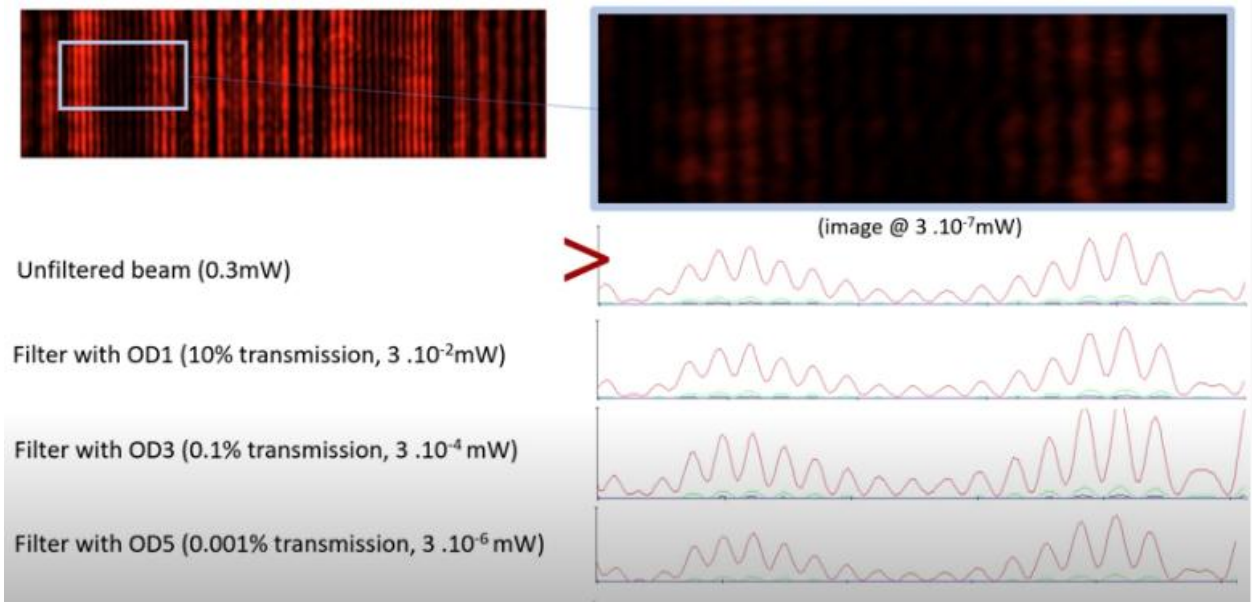


**Figure 2 Wave interference pattern fringes from of a double slit single photons (i.e. one photon at a time in the beam) experiment allowing self-interference of the photons.**

Source: https://www.youtube.com/watch?v=h53PCmEMAGo (Huygens Optics)

A positive result of the proposed experiment would prove classically and macroscopically that quantum randomness is possible to rise from determinism [2] since the Galton Board is a deterministic system environment. Importantly also it will explain classically the quantum wave-particle duality of light and self-interference of single photon in the double slit experiment and finally infer that Heisenberg Uncertainty may be a hidden variables problem in the case of the double slit experiment and contrast the Bell inequality EPR results.

**Update 24 April 2022:** Actually, I was able to find one only instance on the internet of an unverified and unpublished result of a researcher who claims that has got an self-interference pattern from a modified double-slit using single falling balls (by hand one at the time) Galton board:

https://www.youtube.com/watch?v=I-E70sq0D00 (video demonstration)

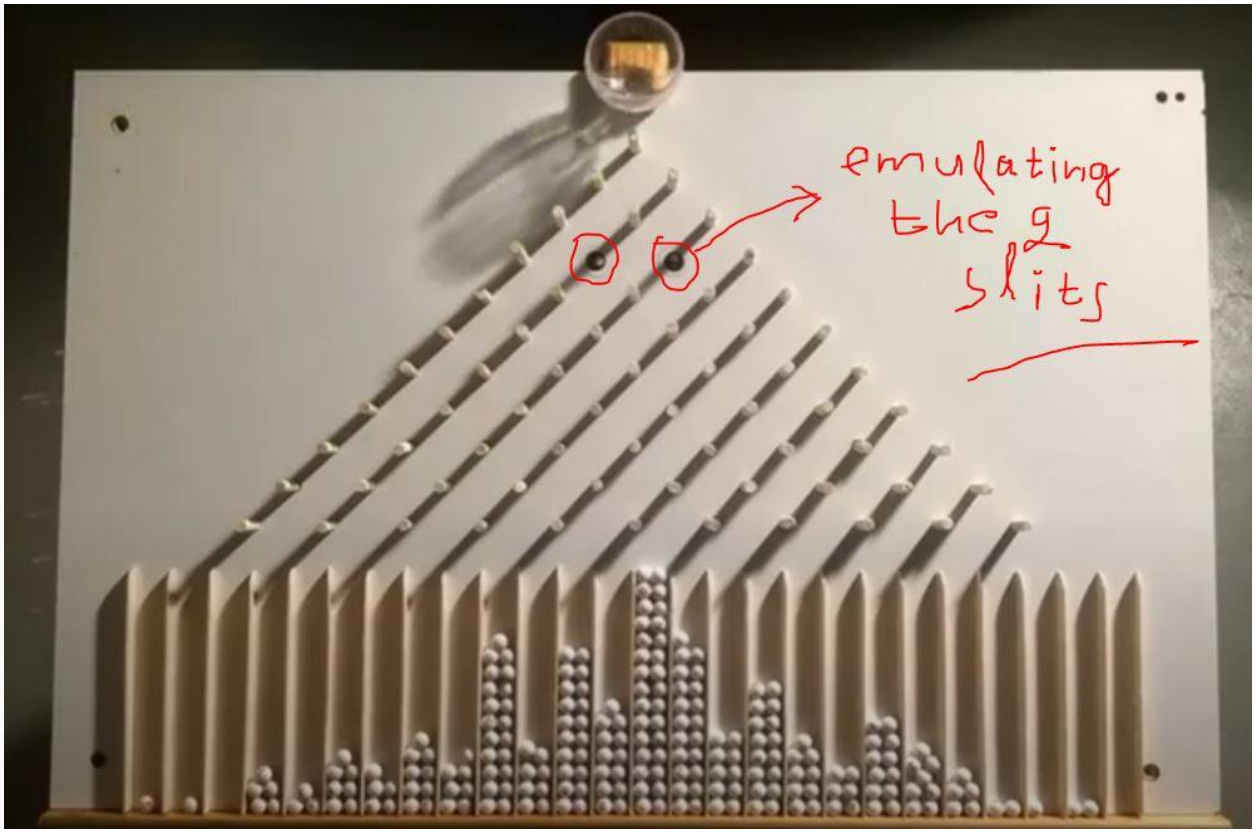


**Figure 3 Self-interference pattern result from a modified double-slit Galton Board throwing a single ball at the time by hand. No Gaussian curve normal distribution but instead a wave interference pattern was claimed to be the end result as reported by an independent researcher in this video ink here, https://www.youtube.com/watch?v=I-E70sq0D00 .**

Two pins shown above in fig. 3 are removed and the two holes are closed with stickers emulating the two slits in the double slit single photon experiment therefore allowing interference. A good approximation wave interference pattern is shown at the end of the experiment clearly opposite to a normal distribution Gaussian curve.

## 2. Conclusion

A modified double-slit Galton Board experiment was proposed to explain classically the quantum double-slit single photon or electron experiments with all the implications of a possible positive outcome of this proposed macroscopic quantum emulation experiment can create.

## References

[1] https://en.wikipedia.org/wiki/Galton_board

**[2]** How Randomness Can Arise From Determinism, https://www.quantamagazine.org/how-randomness-can-arise-from-determinism-20191014/