# JFK Assassination

https://hannahbarton.com/See-the-President-s-head-explode


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# JFK assassination

- Introduction
- JFK assassination
- The physicist : Prof. Luis Alvarez
- The argument based on physics
- Conclusions


http://workingideas.files.wordpress.com/2009/02/jfk.jpg

# Introduction

- **Background**
  - The assassination of John F. Kenedy, 35th president of the United States, took place on November 22, 1963 in Dallas Texas.
  - From the investigation, this was concluded that Lee Harvey Oswald was a lone assassin.
  - The assassination is still the subject of widespread debate and has produced numerous **conspiracy theories** and alternative scenarios.

# JFK assassination (1)

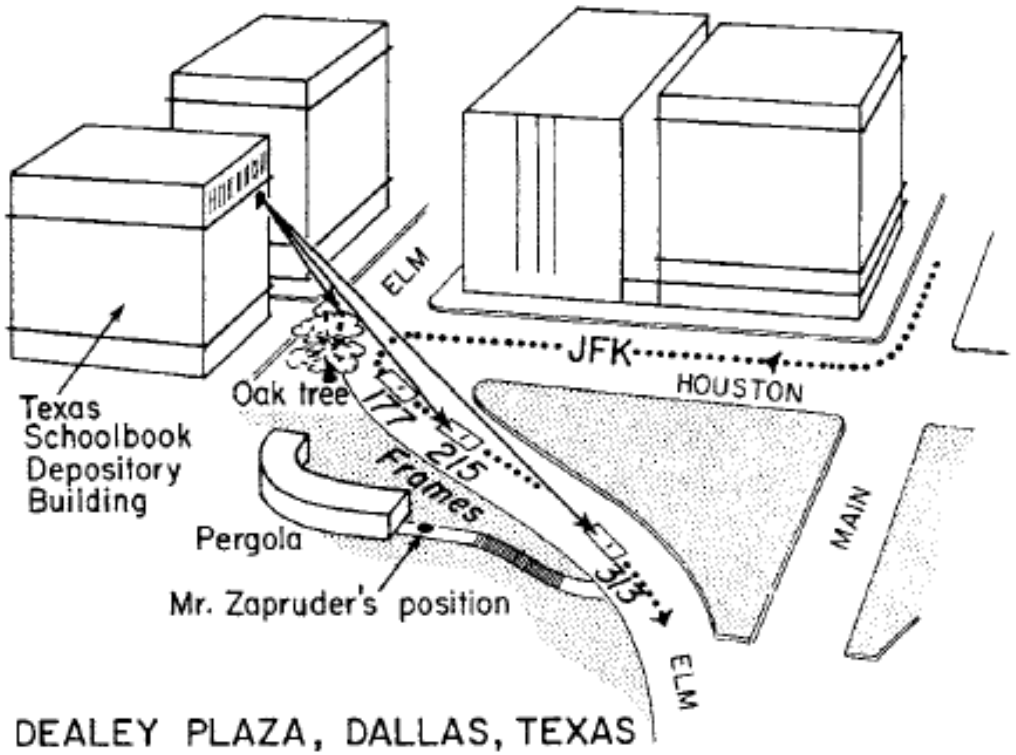
While being driven slowly in an open limousine through the street of Dallas, Texas, the President JFK was shot and killed.

http://www.propagandamatrix.com/images/april2007/300407jfk.jpg

# JFK assassination (2)

•Principal evidence of this historic event is a motion-picture film shot by Mr Abraham Zapruder, standing nearby the route.

•Three shots were fired from 6th floor of the Texas Schoolbook Depository Building.



# The assassin and weapon

Lee Harvey Oswald


Carcano rifle


Carcano cartridge

Magic bullet

https://global.britannica.com/biography/Lee-Harvey-Oswald

# Zapruder's motion-picture

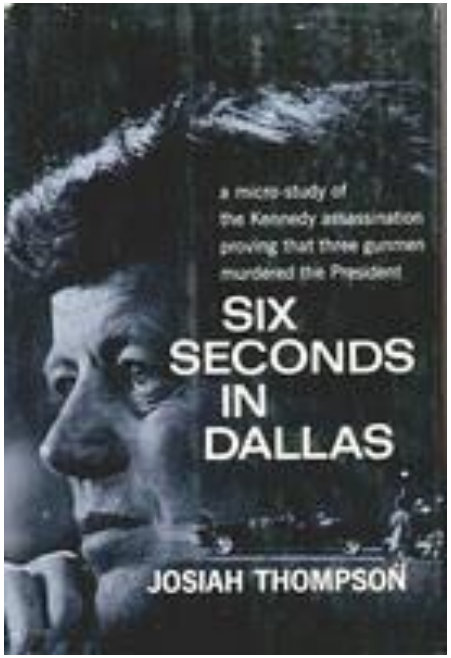
- Notice that the President was hit by an earlier shot, but at frame # 313 of the film blood and brain are blown out of the front of his head.

The Warren Commission tried to calm America's fears of a government overthrow and blamed everything on a half-baked ex-Marine using a rifle with a faulty scope (Oswald).

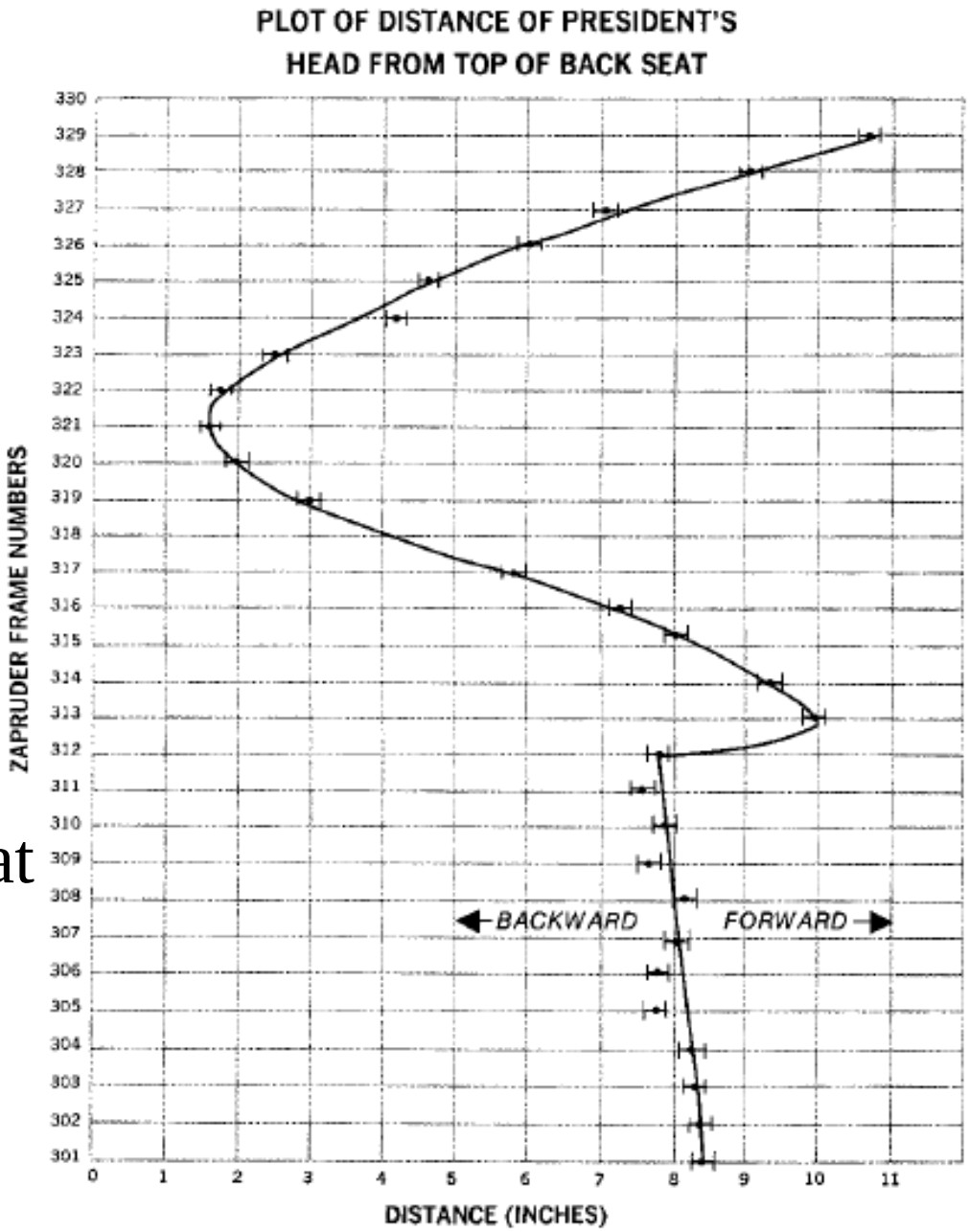
http://jonnieanzures.wordpress.com/2009/04/08/jfk-dark-disturbing-but-informative/

# Conspiracies?

- The strongest argument came from the shot happened between frames 312 and 313.
- Physics says that if you are shot, the momentum of the bullet kicks you in the direction of its motion.
- **The film shows the President's head snapped backward after the fatal shot.** To the majority of the American public, there must have been two shots in quick succession, the first from behind, the second from in front, and thus two shooters (at least) and a conspiracy.




The motion of the President's head relative to the back of the rear seat of the limousine a 1967 book, Six Second in Dallas by Prof. Josiah Thompson.



# The Physicist : Prof. Luis Alvarez

- Nobel Laureate physicist Luis Alvarez proposed the "jet effect" as mechanical way to explain the sudden backward movement of JFK's head after being hit by the fatal bullet.
- The "jet" refers to the brain matter exploded from the President's head.

# The argument based on Physics

- The analysis involves three interacting masses, the bullet, the jet of brain matter and the remaining part of the head.

- There were two actions occurred successively.
  - The bullet hit the President's head.
  - The jet of brain matter blown up.

# What Physics were used to explain the JFK assassination?

- The analysis is based on an inelastic collision.
- The ballistic pendulum is used as a simple model for the analysis

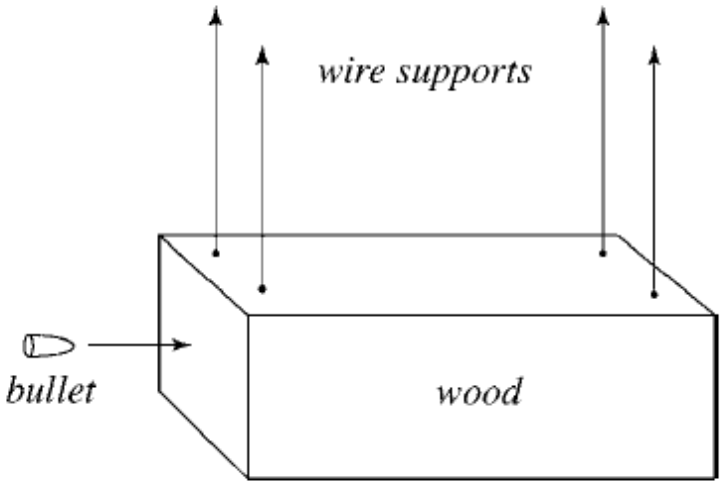



Fig. 11. A ballistic pendulum.

$$K(\text{bullet+pendulum}) = \frac{p^2}{2(m+M)} = \frac{p^2}{2\times 1000m}$$

$$= \frac{1}{1000}\frac{p^2}{2m} = \frac{1}{1000}K(\text{bullet})$$

99.9% of the bullet kinetic energy turned to other forms

Am. J. Phys., Vol. 75, No. 11, November 2007

# Backward movement due to the conservation of momentum

- Prof Alvarez modeled the JFK head shot as the interaction between a bullet, a jet (blood and brain matter) and a target with masses $m_b$, $m_j$ and $m_t$, respectively.

$$K_j = \frac{p_j^2}{2m_j} = fK_b = f\,\frac{p_b^2}{2m_b};\ f:\ \text{a fractional number}$$

- The momentum of the jet $p_j^2 = f\,\frac{m_j}{m_b}\,p_b^2$

suppose $f = 1/10$ and $m_j/m_b = 15;$

- Due to the conservation of momentum $p_b = p_j + p_t$
- Therefore, $p_t$ is required to be **negative** to satisfy the conservation of momentum. The target moves **backward**, *toward* the shooter.

# Words of caution

- This must be emphasized that Prof Alvarez wanted to show that the sudden backward movement of the President's head was possible with a single bullet.

- He showed no attempt to answer the question about the number of shooters and how many bullets were fired.

# Conclusions : JFK assassination

- The missing fraction of the kinetic energy can cause the pressure to build up in the brain and skull of the President's head.
- Subsequently, the President's head blew up and pieces of skull and scalp and brain tissues were suddenly and forcefully released.
- The direction of the explosion is random. In this case the direction was opposite to the direction of the hitting bullet. This then forced the President's head to suddenly move backward to the shooter.

# References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2. C G Wohl, “Scientist as detective : Luis Alvarez and the pyramid burial chambers, the JFK assassination, and the end of the dinosaur”, Am. J. Phys., Vol. 75, No. 11, November 2007, p. 968-977.
3. Nalli NR. Gunshot-wound dynamics model for John F. Kennedy assassination [published correction appears in Heliyon. 2018 Oct 01;4(10):e00831]. *Heliyon*. 2018;4(4):e00603. Published 2018 Apr 30. doi:10.1016/j.heliyon.2018.e00603