

# Projectile Motion

A low tech lab that took my breath  
away in 1992

Guy Vandegrift

# Acknowledgements

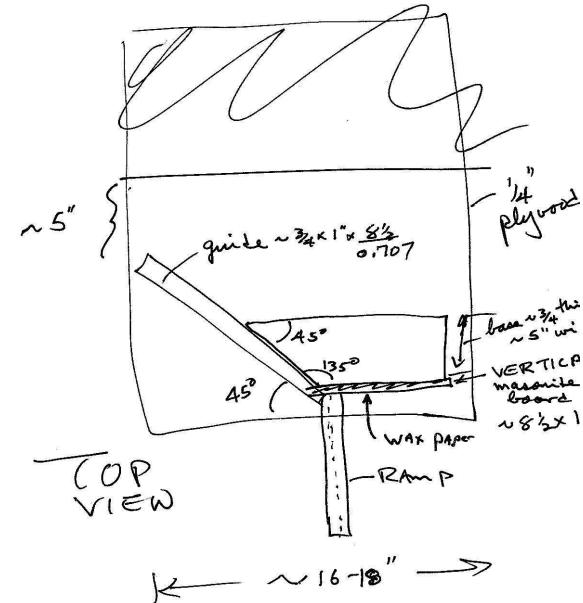
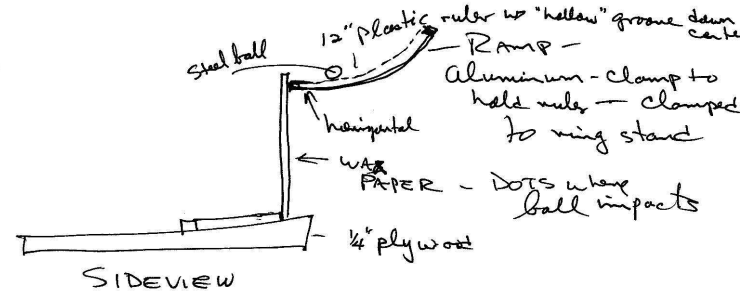
- **Last week:** (relative to March 1, 2007)
  - Mario Bustos (VMC)
  - Bob Muir and Steve Danford (UNCG)
- **50 years ago:**
  - Physical Science Study Committee (PSSC)
- **400 years ago:**
  - Galileo Galilei

## Bob's drawing

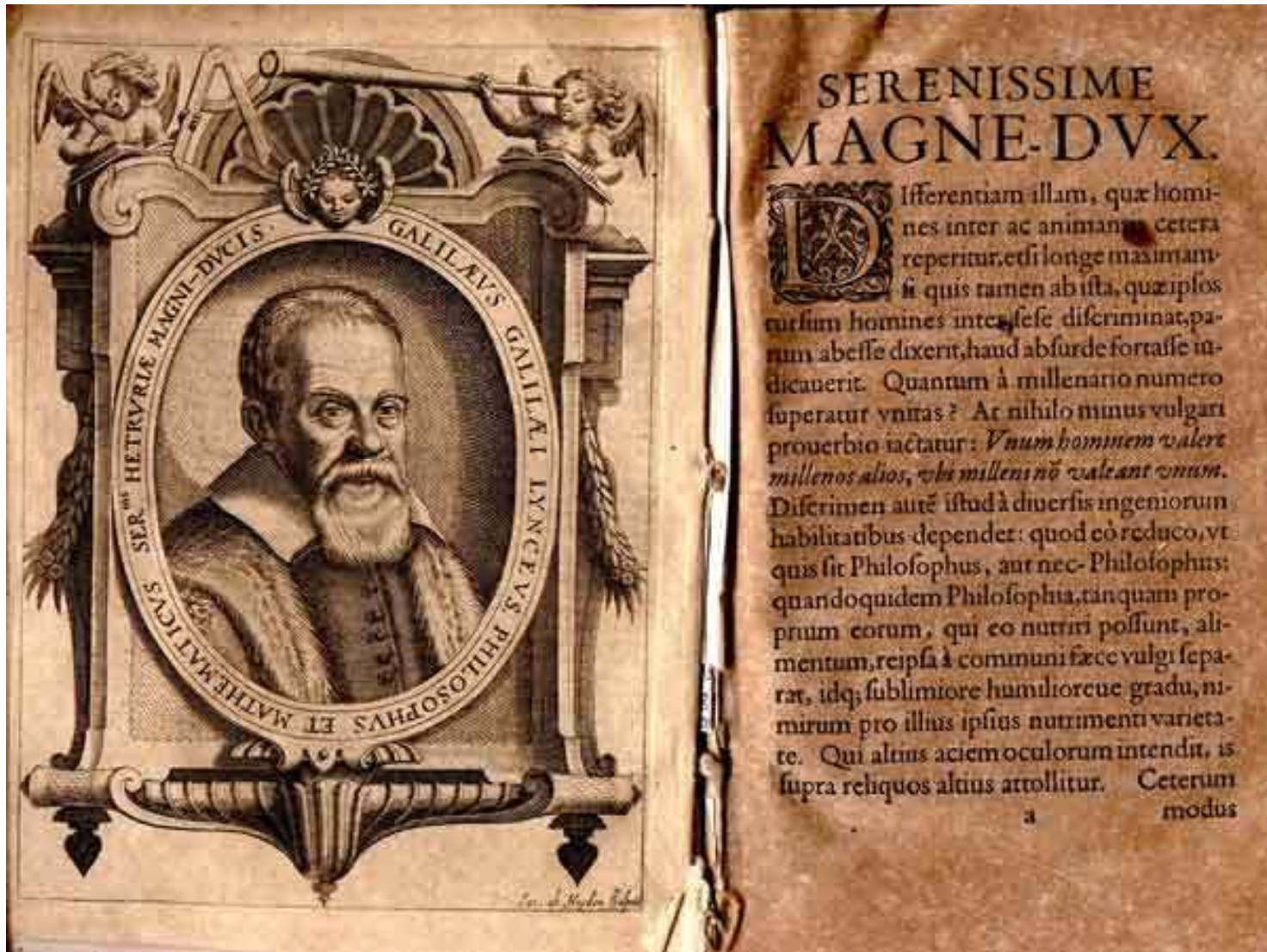
Guy --- attached is Bob's sketch (from memory) of what this thing looked like ... we haven't used it in some years. You know we moved to our temporary quarters last summer and a large amount of equipment is misplaced...

We think it was home-made PSSC physics, and there are a bunch of online PSSC websites (though most seem to be remembrances and not quite useful).

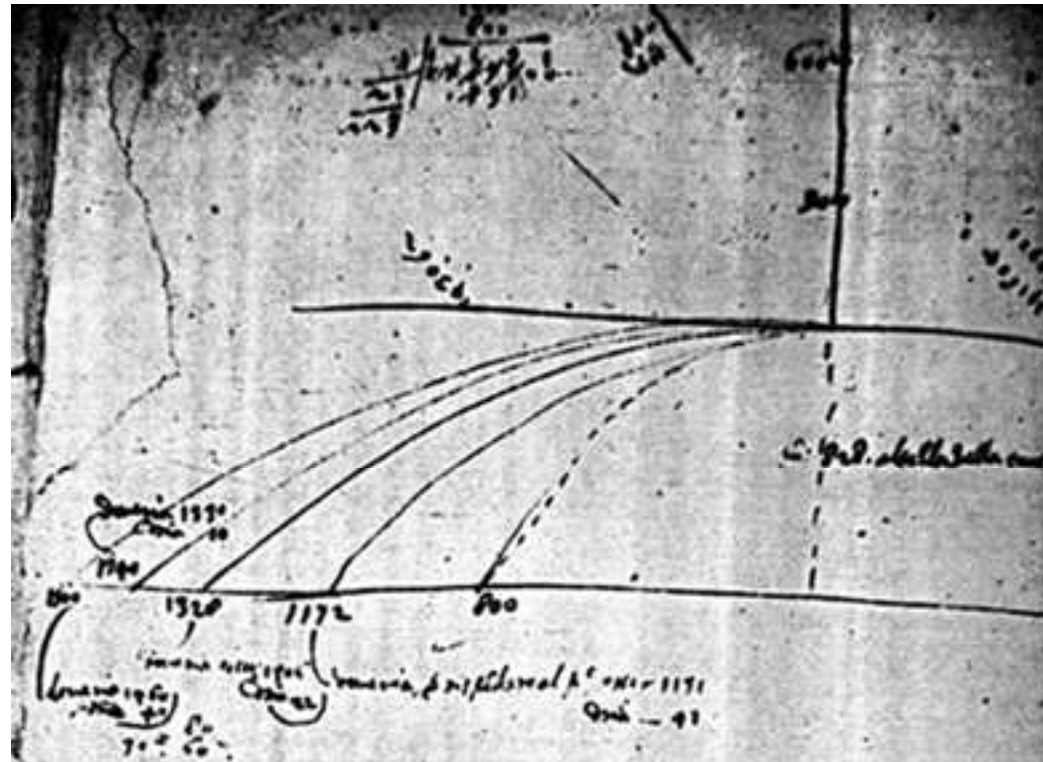
(email from Steve Danford)



## Galileo's Book

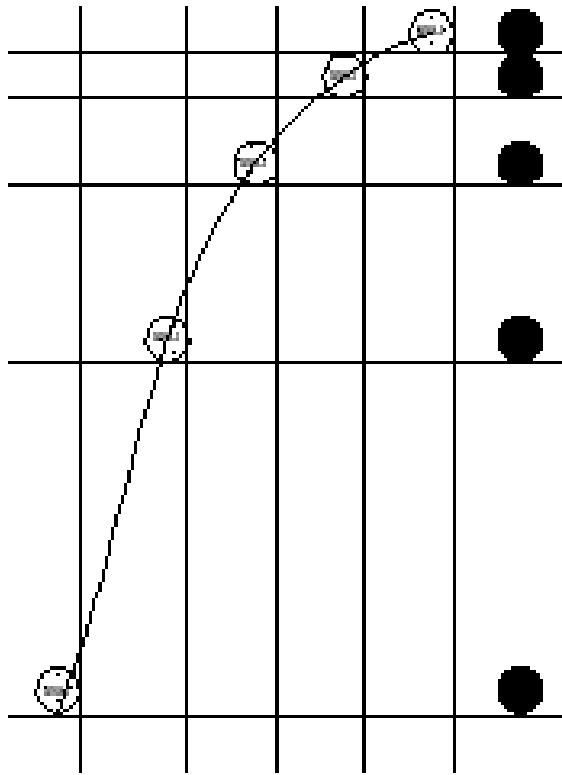


## Galileo's notes



Galileo's original notes on projectile motion. Most of his experimental work on this used balls and ramps. The device I used was invented by PSSC circa 1960, I think.

# Free fall and projectile motion



... the now, or measure, of time; divide this of segments,  $bc$ ,  $cd$ ,  $de$ , representing equal in the points  $b$ ,  $c$ ,  $d$ ,  $e$ , let fall lines which are

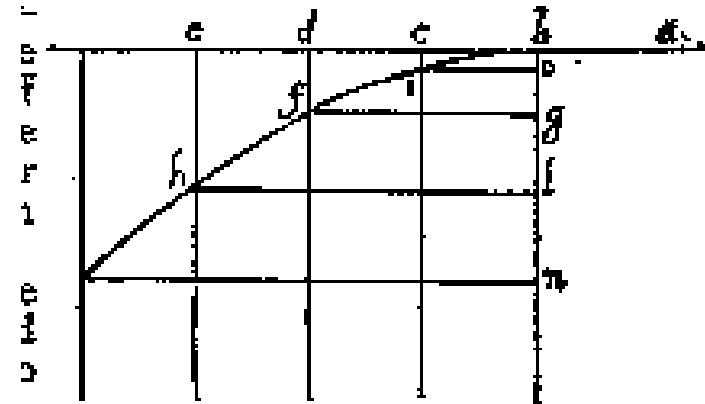


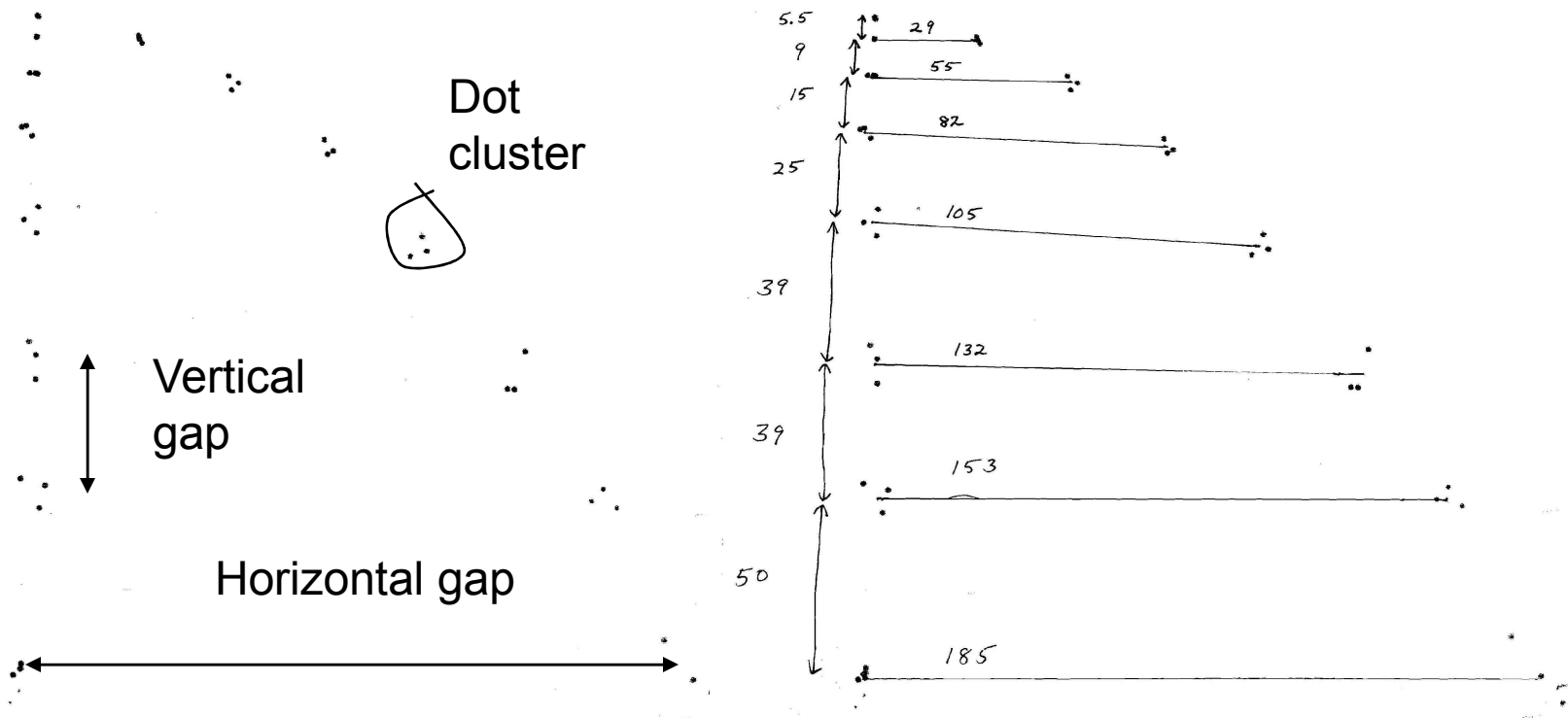
Fig. 108

these same lines. Accordingly we see that from  $b$  to  $c$  with uniform speed, it also falls through the distance  $nl$ , and at the end of the itself at the point  $l$ . In like manner at the

Right: Projectile motion and a free-falling object.

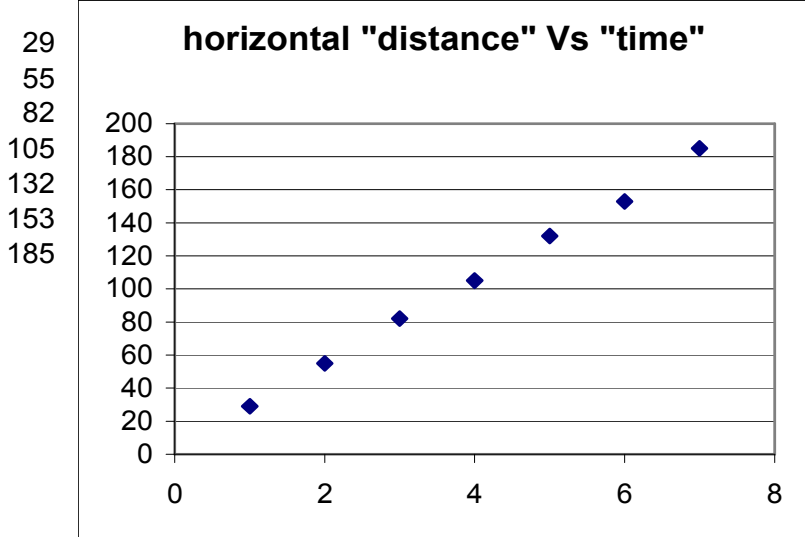
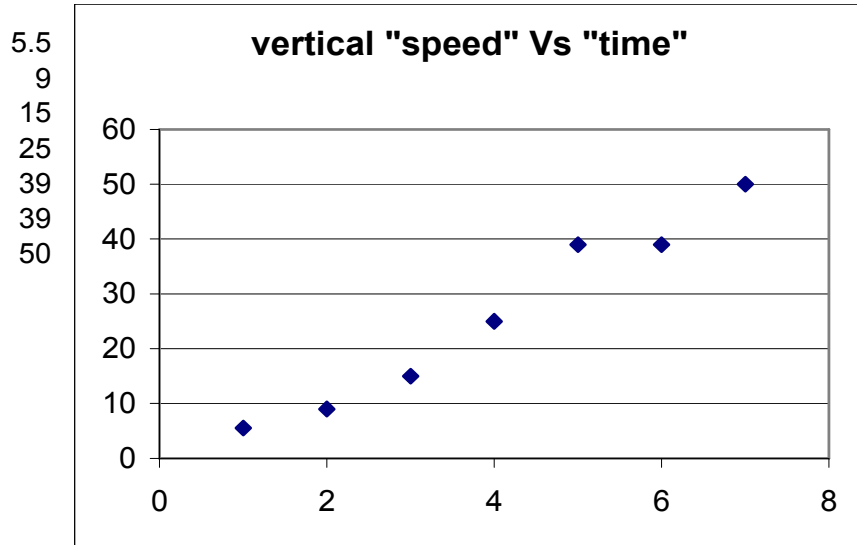
Left: Excerpt attributed to a translation of Galileo's book into English.

# Data from PSSC simulator



- The horizontal gap represents “horizontal displacement”
- The vertical gap represents “vertical velocity”.
- Each dot cluster represents a different “time” (the ball was rolled 3 times)

# Plots made with Excel



Both data seem to fit straight line. Therefore:

- Horizontal distance increases linearly with "time".
- Vertical speed increases linearly with "time"

# Why I like “low-tech” labs

- Historical context
  - *Lest we forget who and what preceded us*
- No “hidden” technology
  - *What you see is what you get*
- Excitement
  - *If you make it, it might not work*

# Apparatus used to collect the data

