PAOLO PALMIERI. ***A history of Galileo's inclined plane experiment and its philosophical implications*****. The Edwin Mellen Press. 2011**

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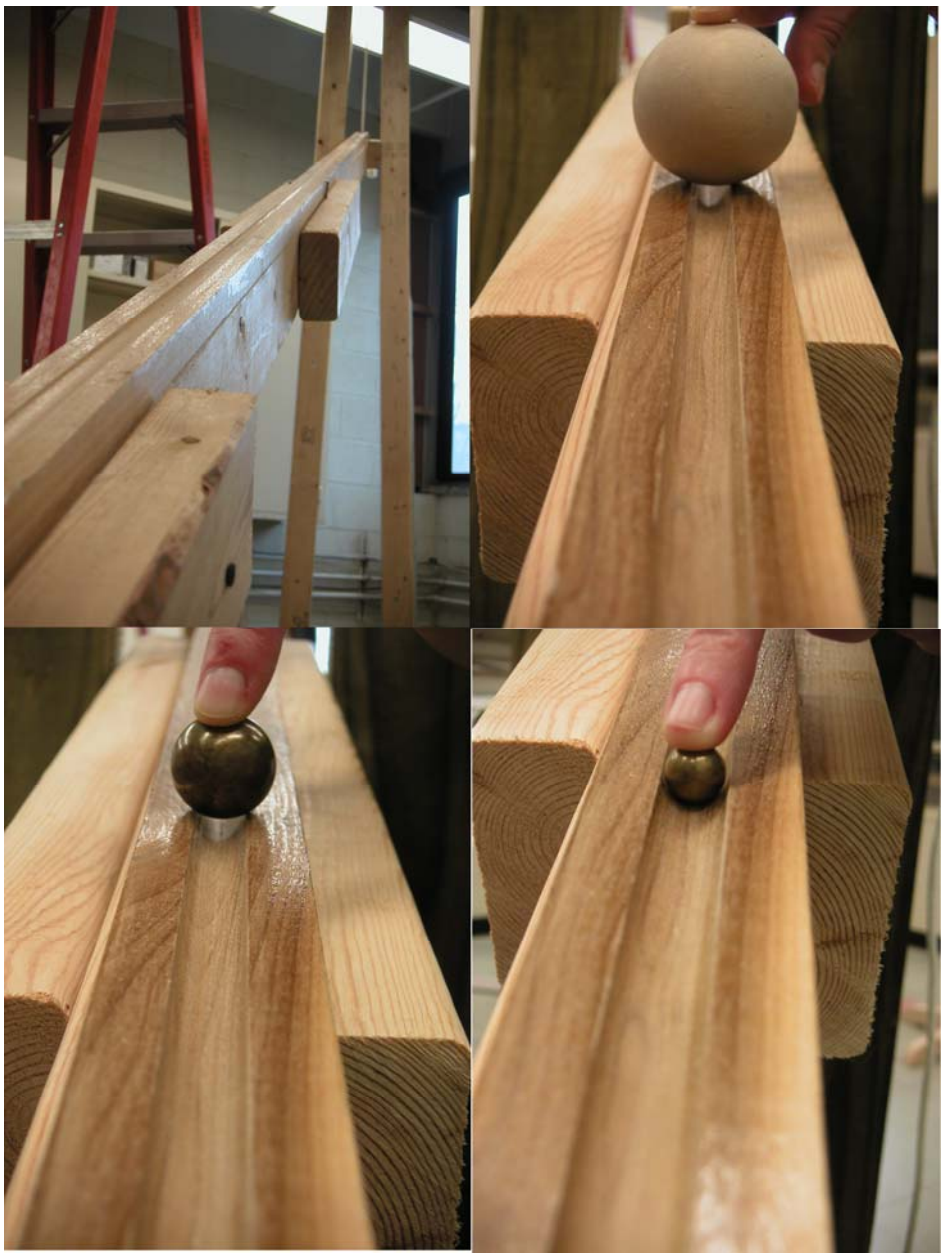
MULTIMEDIA MATERIAL

The material discussed in this document illustrates the experiments which were performed while I was researching the book. The sound and video files are freely downloadable at www.exphps.org.

THE GENERAL SETUP

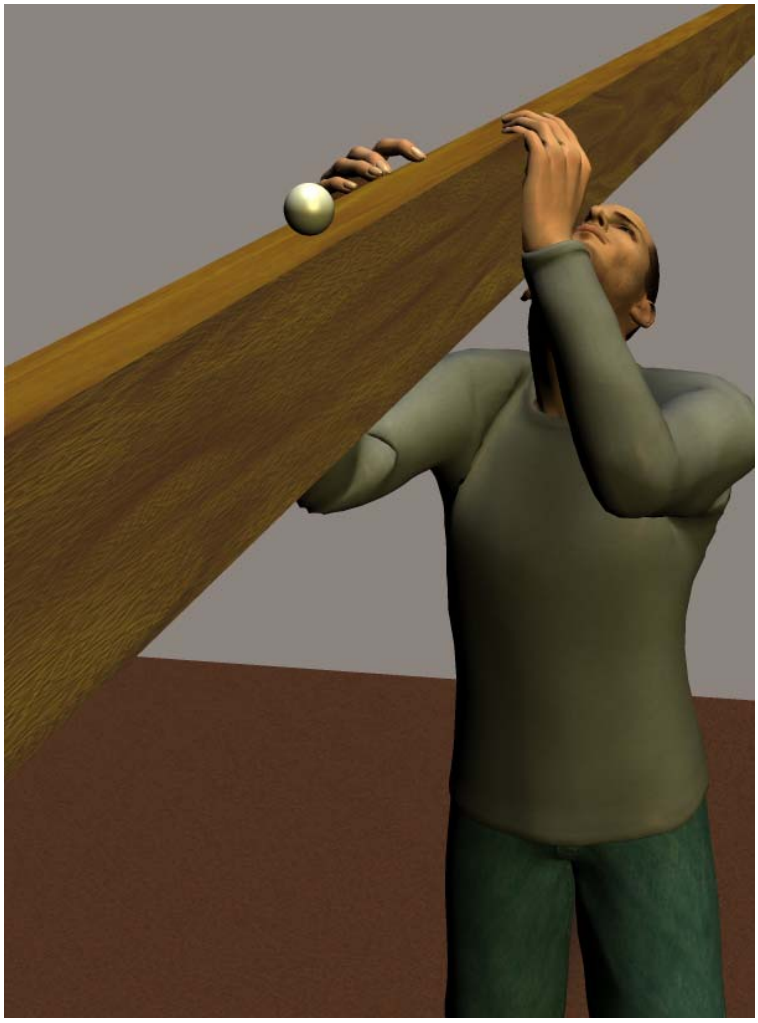


The inclined plane reconstructed at the University of Pittsburgh in 2007. A 21-foot long wooden beam is supported by two sturdy wooden towers consisting of two posts each (one of the towers is partly visible in the upper left picture, the other is movable back and forth and generally placed in the middle) so that the elevation of the inclined plane can easily be adjusted with ropes. A circular groove was machine cut in two slender wooden beams which were placed above the 21-foot long wooden beam of the plane. The diameter of the circular cut was slightly more than 7/16 inch. Upper right: a wooden ball on the groove. Below: left: a 1-inch brass ball sitting on the groove; right: a 7/16 inch brass ball inside the groove.

THE CELLO EXPERIMENT

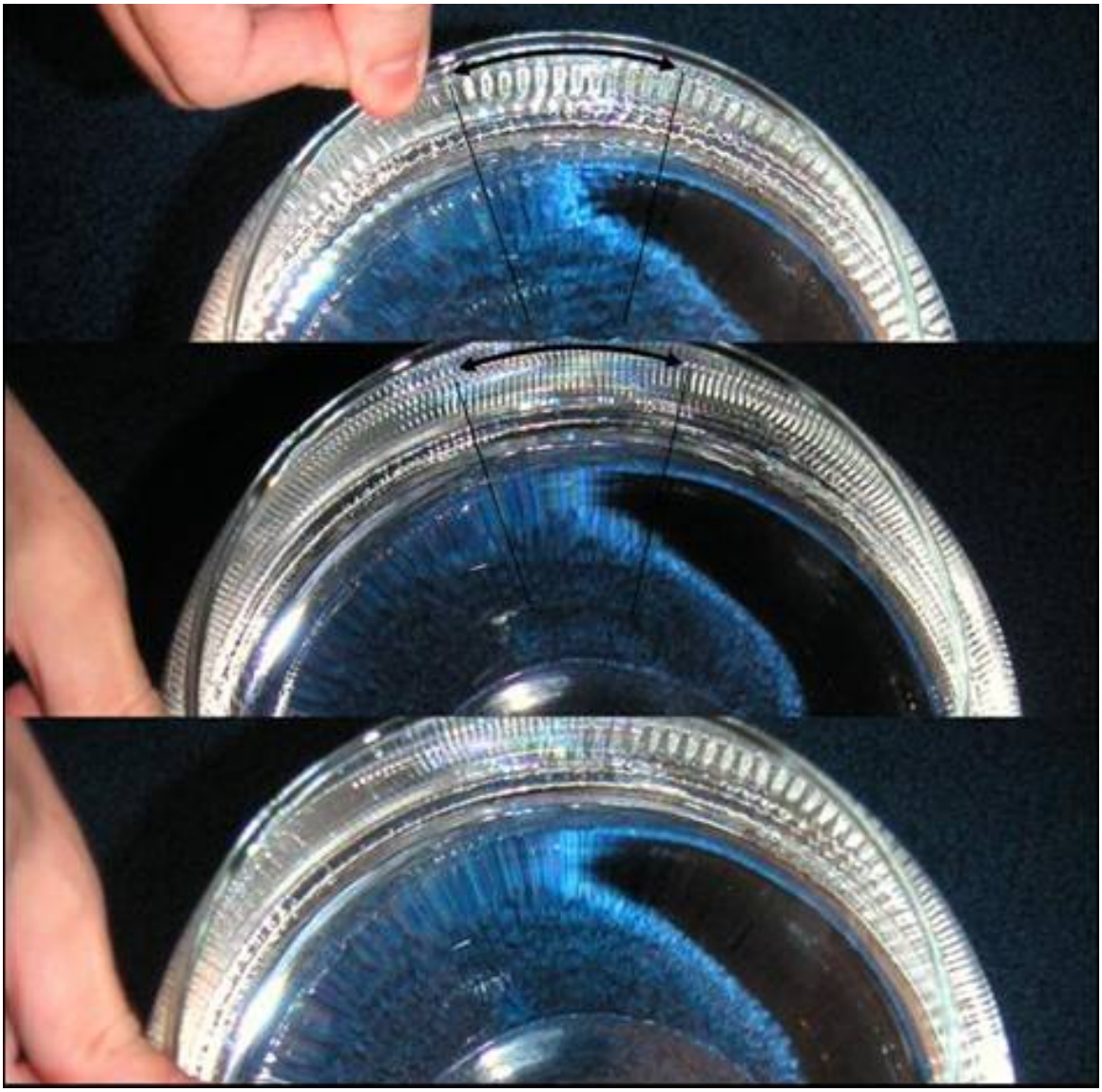
The cello experiment was videotaped with a Panasonic digital video camera. The video (named “Cello experiment”) is unedited and has the live comments made by William Lebing and Paolo Palmieri during the recording of the experiment. Thanks to William for his kind participation in this project.

The auscultation of the inclined plane



The auscultation of the inclined plane in a multisensory modality. The operator assumes a particular posture in which the face's portion above the nose is brought into contact with the wooden beam from below. The forehead or a part of it must touch the beam. The hands grasp the wooden beam around its sides so that the fingertips will sense the upper side of the beam.

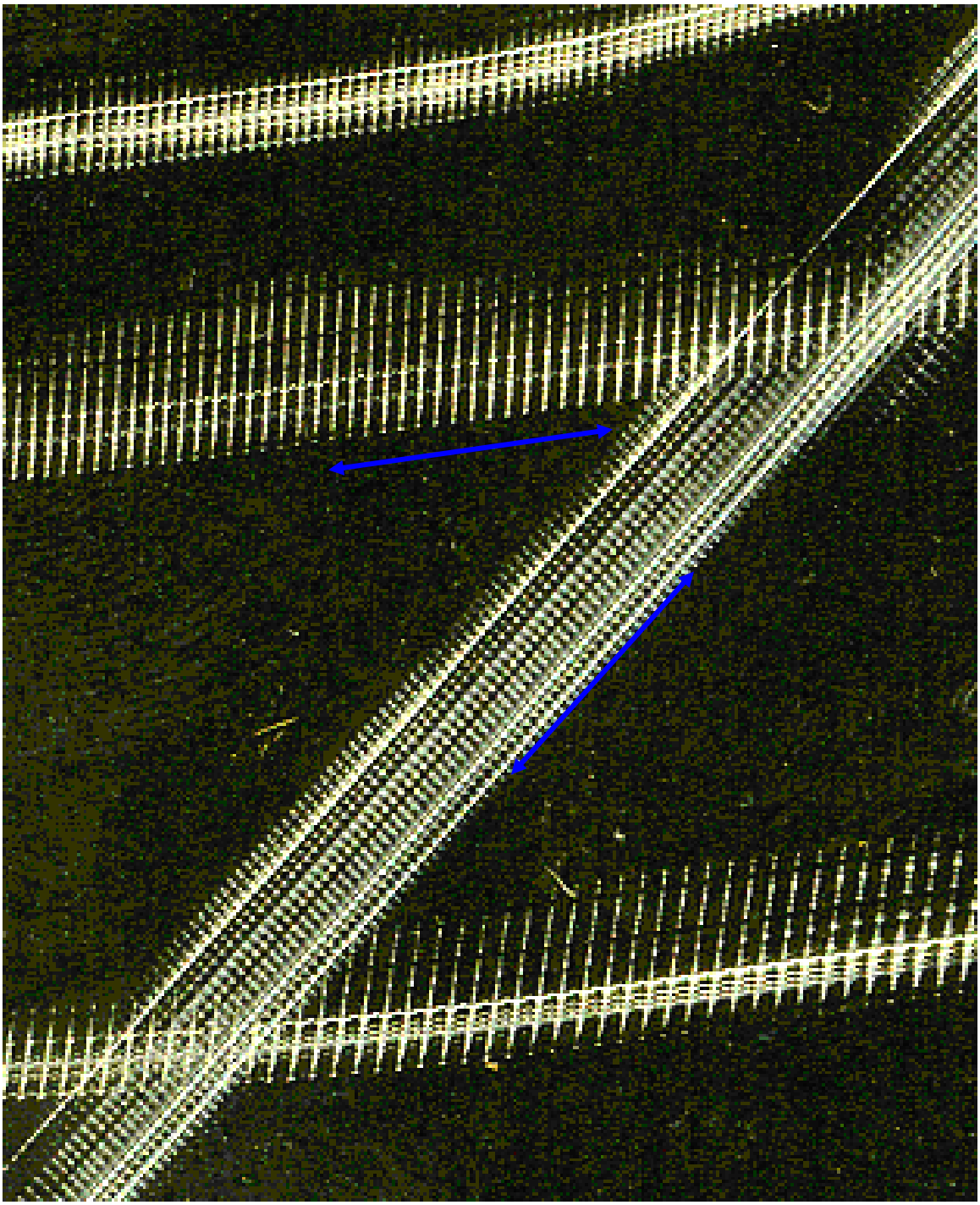
The goblet experiment



There are 13 crests (above) and 28 (middle), close to the ½ ratio expected for the octave; also note the splitting of the pattern at the moment of the transition between the two tones (below). Learning how to produce the octave above the fundamental tone of the glass requires some practice. The wave patterns can be seen close to the rim of the glass because their energy dissipates rapidly as they expand. They are radially oriented, that is, crests and troughs are oriented towards the center of the circular water surface.

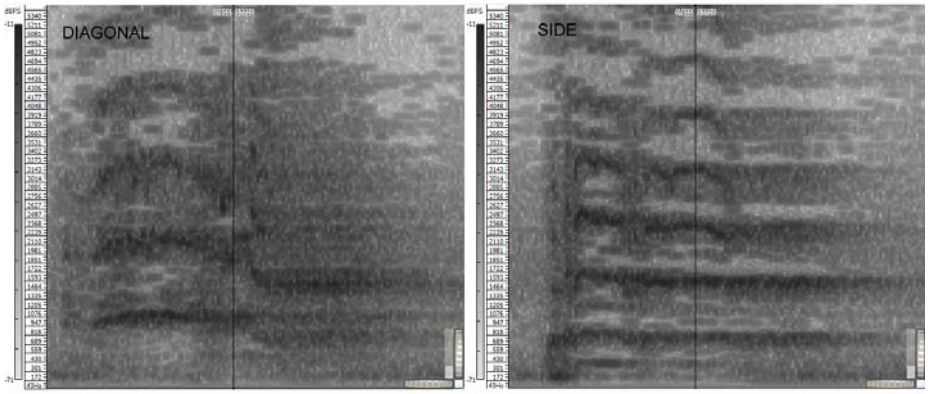
THE BRASS PLATE EXPERIMENT

Two videos are also available of the brass plate experiment. The longer one (named “brass plate”) shows an entire session while I gradually improved my playing skills. The short version (named “brass plate short version”) shows the final portion of the session when I obtained the two sounds producing the Pythagorean fifth. Three sound files (“side”, “diagonal”, and “side and diagonal together”) demonstrate the sounds of the howling brass plate.



The howling brass plate experiment. The regular footprints of pitch, Galileo's *virgolette*, are clearly visible. There are about 20 marks in the upper trace in a unit length. There are about 29 marks in the trace along the diagonal in the same unit length.

The spectra of sounds generated by the brass plate



Spectra of the sounds that left the footprints on the brass plate shown in the above figure. The fundamental frequency along the diagonal is about 1000 Hz whereas the fundamental frequency along the side is about 700 Hz, close to the 3 to 2 ratio of the Pythagorean fifth, and in agreement with the number of marks in the footprints left by the sounds.

INCLINED PLANE SOUNDS DATA

The following table gives the data of the inclined plane run corresponding to each sound file. For example, the sound file named “Trial 1” corresponds to a run obtained with Inclination =6.78^{o} and Brass 1 inch 72.6 gram ball. The sound file named “t1 high pass 512 reverb” corresponds to the same run but the sound has been digitally processed in order to improve the acoustic image, by filtering the original recording with a high pass filter, cutoff frequency 512Hz, and a reverb effect. The sounds were recorded with a laptop computer equipped with a Yamaha GO46 Mobile FireWire Audio Interface. Two AKG Perception 420 Studio Condenser Microphone were used. The post processing of the sound files was done in Max 5.0.

Inclination =6.78^{o}	
Brass 1 inch 72.6 gram	Trial 1
Bronze 1 inch 76.5 gram	Trial 2
Brass 7/16 inch 6.1 gram	Trial 3
=	Trial 4
Bronze 7/16 inch 6.4 gram	Trial 5
=	Trial 6
Brass ¾ inch 30.9 gram	Trial 7
Bronze ¾ inch 32.3 gram	Trial 8
Brass 5/16 inch 2.2 gram	Trial 9
=	Trial 10
Bronze 5/16 inch 2.3 gram	Trial 11
=	Trial 12
Wood ball 2 inch 41.3 gram	Trial 13
=	Trial 14

Inclination=12.52^{o}	
Brass 1 inch 72.6 gram	Trial 21
Bronze 1 inch 76.5 gram	Trial 22
Brass 7/16 inch 6.1 gram	Trial 23
=	Trial 24
Bronze 7/16 inch 6.4 gram	Trial 25
=	Trial 26
Brass ¾ inch 30.9 gram	Trial 27
Bronze ¾ inch 32.3 gram	Trial 28
Brass 5/16 inch 2.2 gram	Trial 29
=	Trial 30
Bronze 5/16 inch 2.3 gram	Trial 31
=	Trial 32
Wood ball 2 inch 41.3 gram	Trial 33
=	Trial 34