LIGO – Livingston, LA

MIT Alumni Tour – March 2013

Led by Rai Weiss

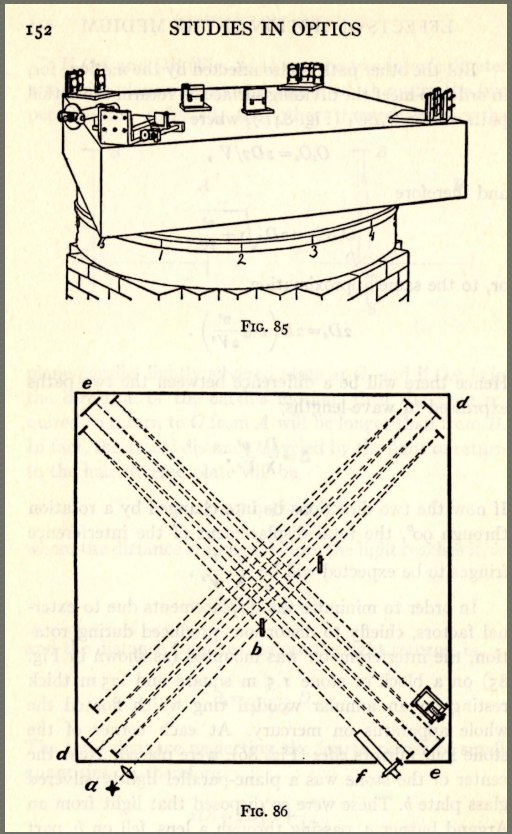
Photos by Rick Dower

First a little history

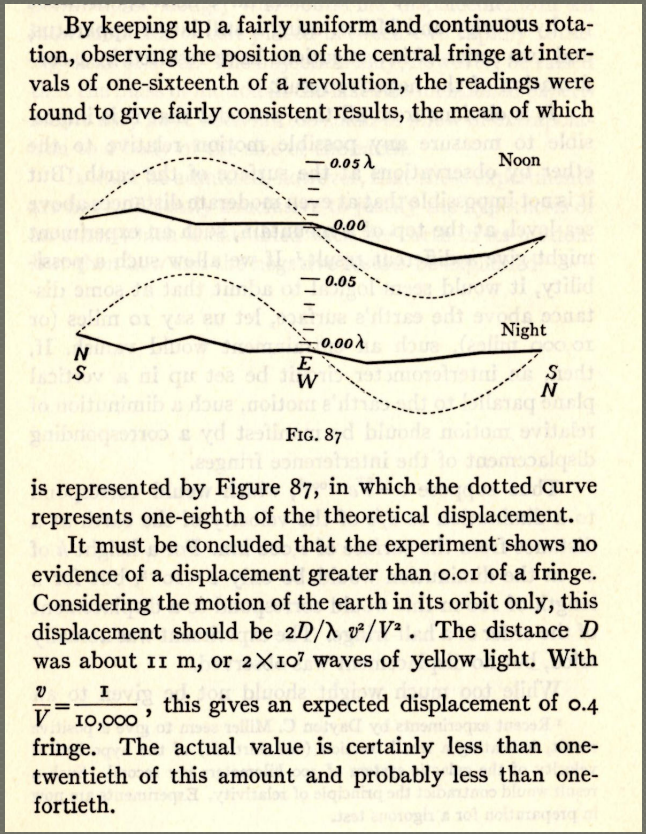
- Albert Michelson (1852-1931)
- First American to receive Nobel Prize (Physics 1907)
- Developed interferometer to detect Earth's motion through ether

Michelson-Morley Experiment 1887-1888

STONE BLOCK
1.5 M X 1.5 M X 0.25 M



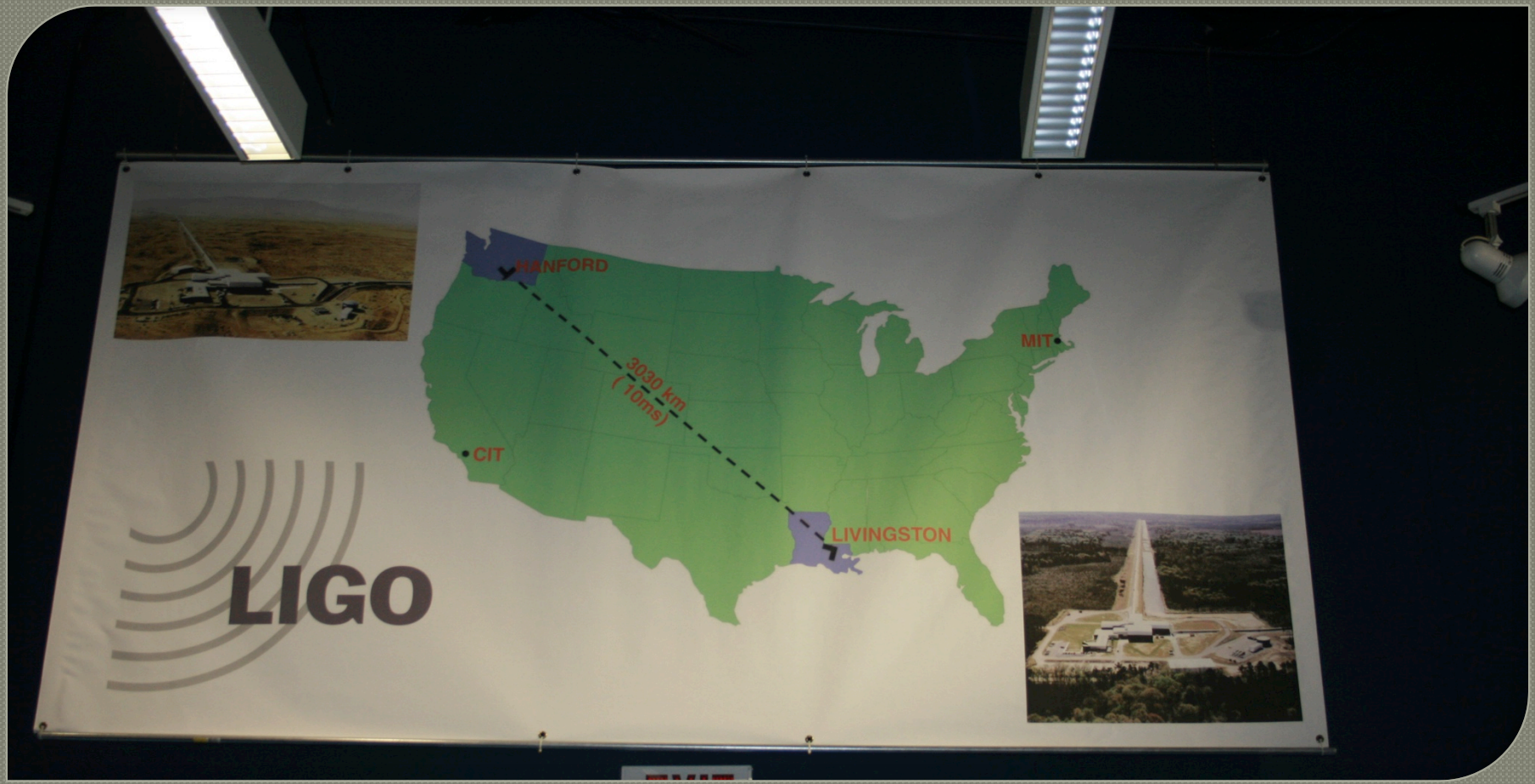
NO DISCERNABLE FRINGE SHIFT



"But then how can the negative results be explained?"

A. Michelson, *Studies in Optics*,
University of Chicago Press, 1927, p.155.

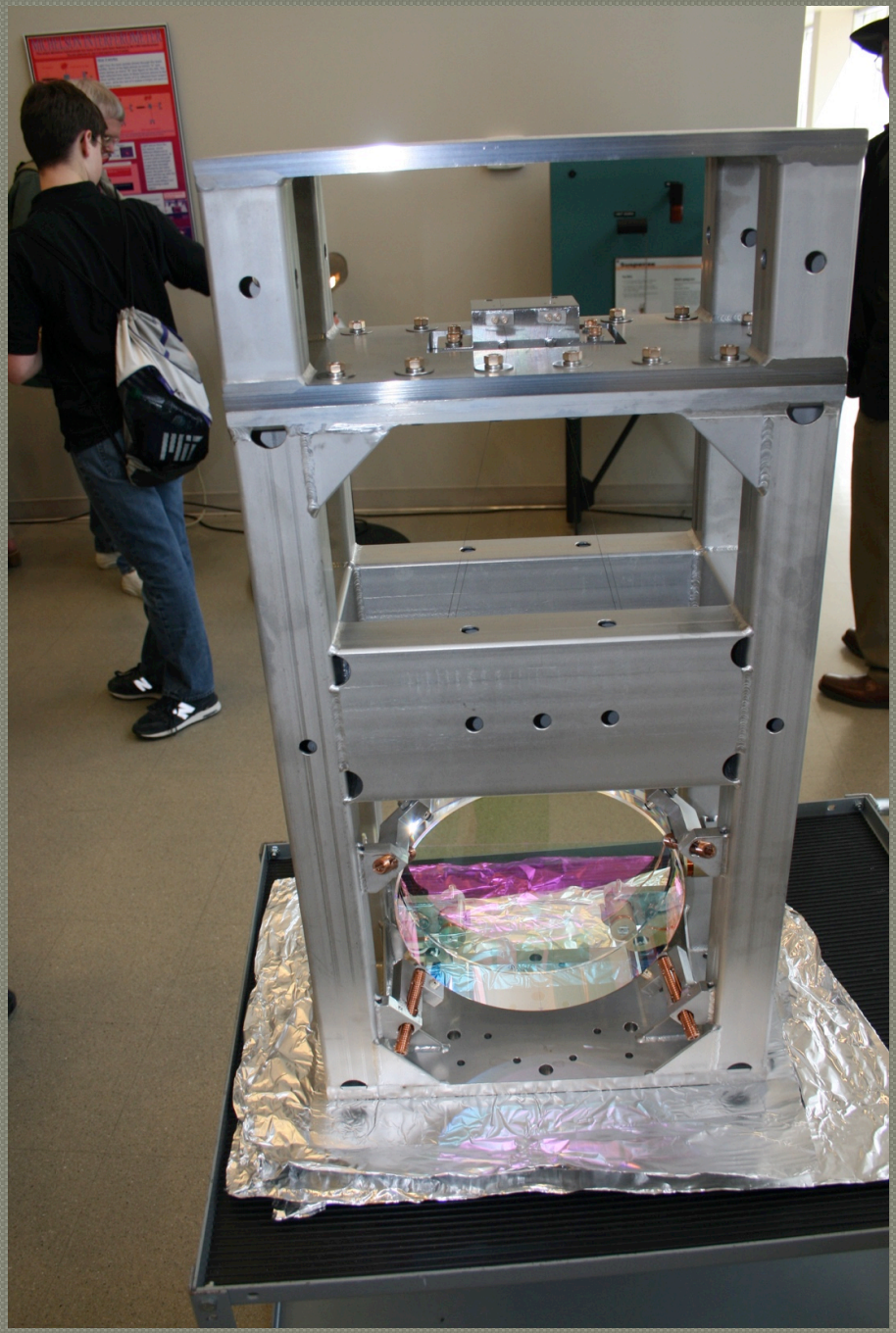
Michelson used an interferometer to measure the size of stars. Interferometers were subsequently adapted to do precision measurement of many kinds and control precision machines.



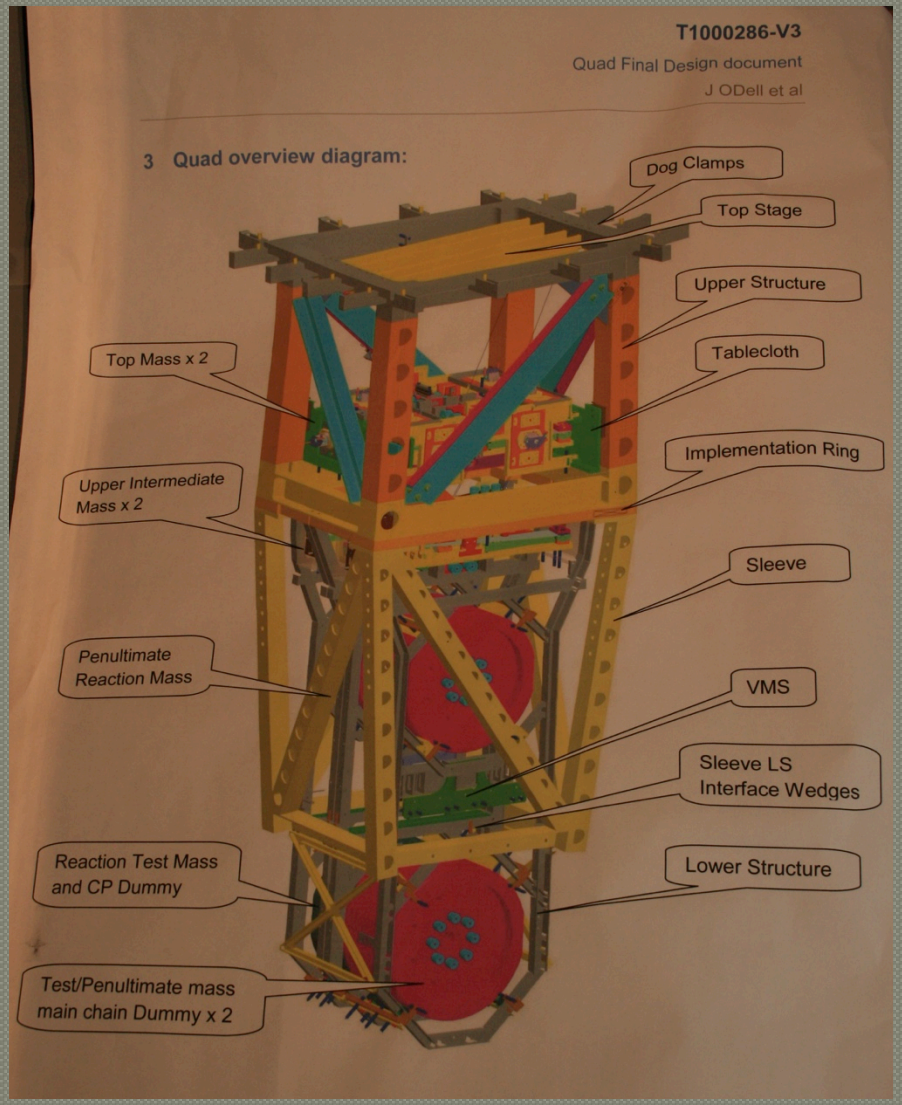
LIGO location map and aerial photos


LIGO
Livingston
Observatory
A Collaboration of
California Institute
of Technology
Massachusetts Institute
of Technology
Operated for
National Science Foundation

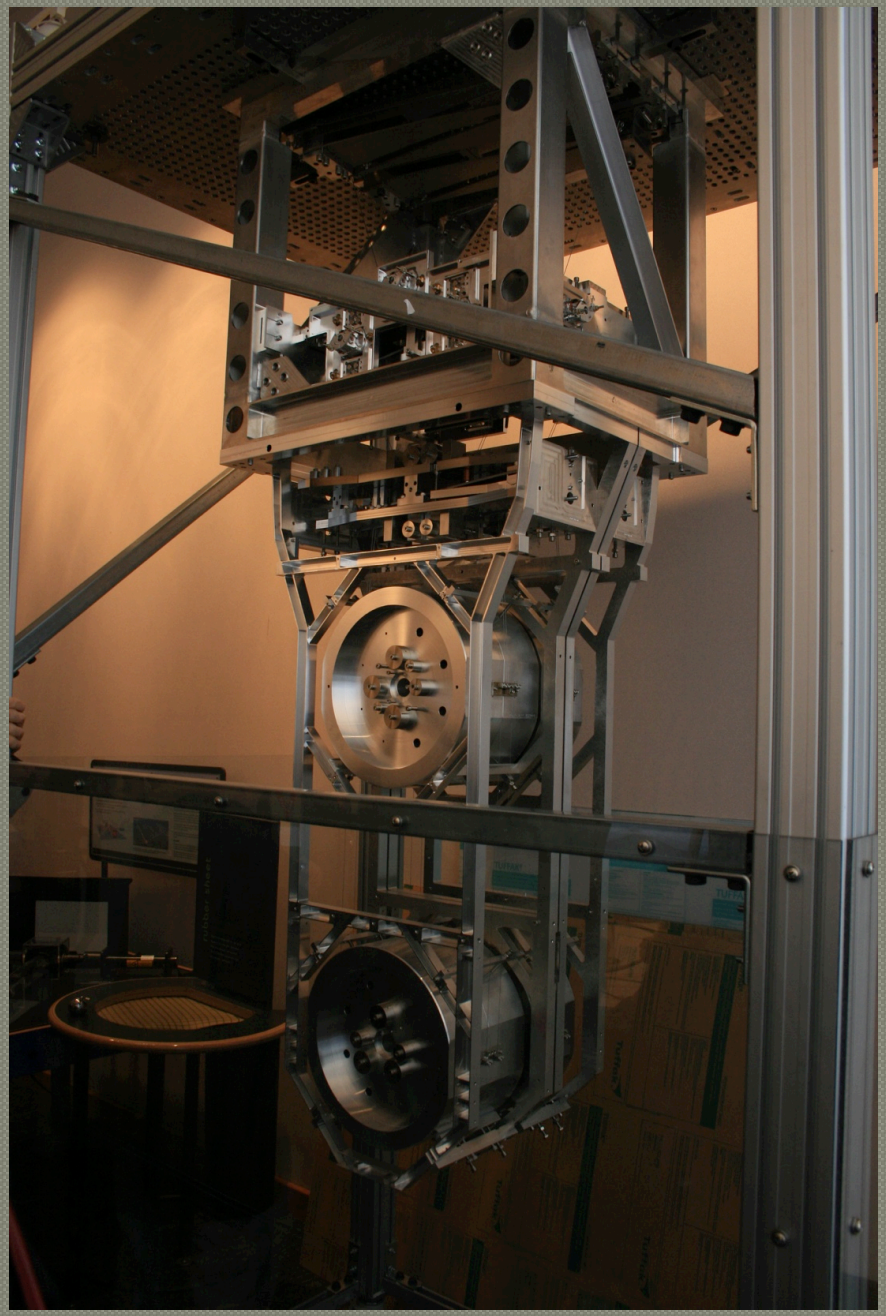
Visitors Center and other buildings



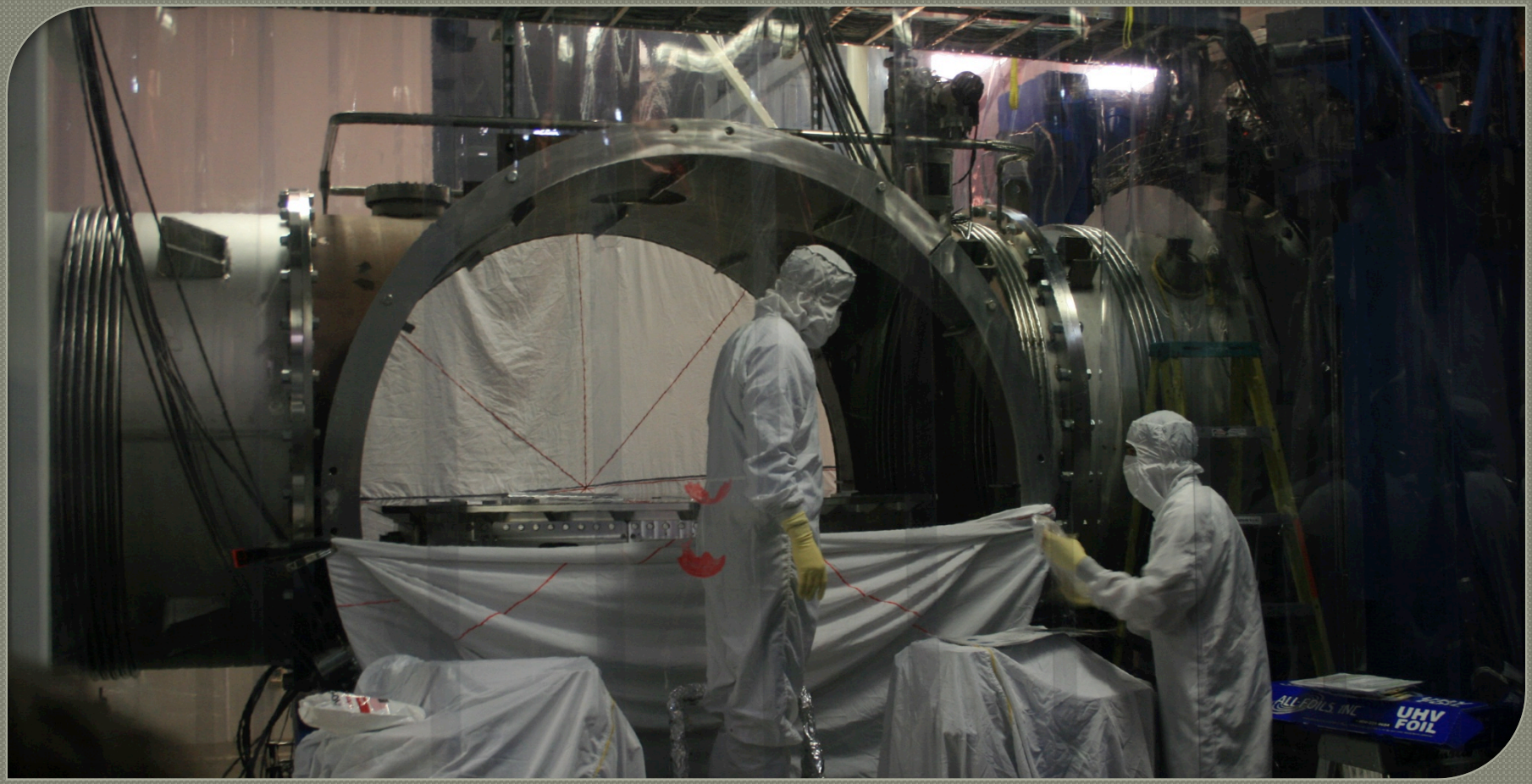
Original Mirror and Mount



Advanced LIGO Mirror Mount Diagram

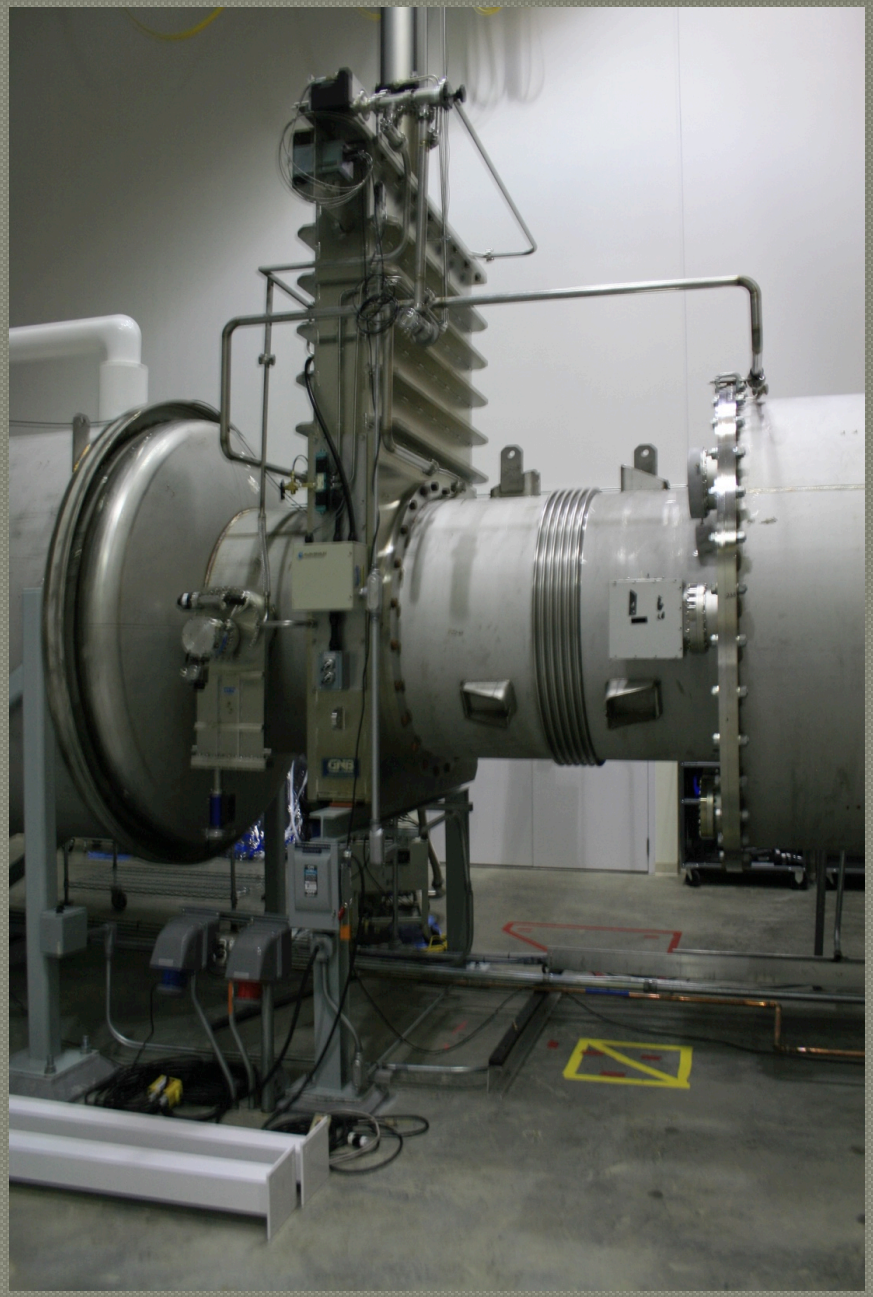


Advanced LIGO
Mirror Mount



LIGO Vacuum Chamber - Open

Vacuum tube near building exit



Vacuum tube junction

Vacuum tube - continuous weld

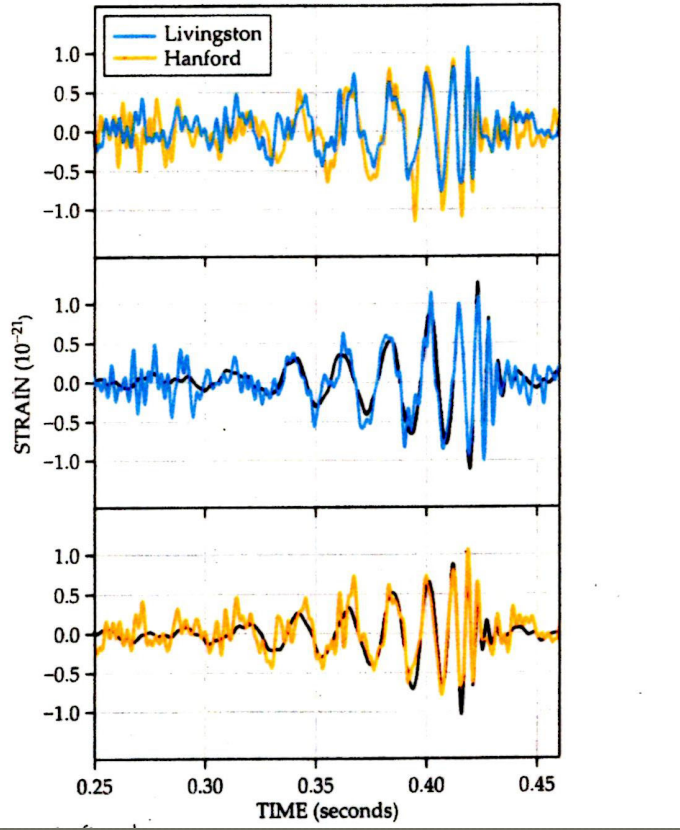
Interferometer Arm Intersection

Interferometer arm
to far mirror

LIGO Control Room

LIGO success
14 September 2015 05:51CDT

FIGURE FROM *PHYSICS TODAY* APRIL 2016



CAPTION FROM *PHYSICS TODAY* APRIL 2016

FIGURE 1. SIGNALS RECEIVED by the Laser Interferometer Gravitational-Wave Observatory instruments in Livingston, Louisiana, and in Hanford, Washington, were the first direct detection of gravitational waves. At top, the Hanford signal has been shifted in time to correct for the arrival-time delay between the two detectors, and inverted to account for the Hanford detector's orientation relative to Livingston. The lower two panels show the observed data individually, along with best-fit calculations (black) generated from numerical relativity simulations. (Courtesy of Caltech/MIT/LIGO Laboratory.)

P. S. MIT Celebration 19 February 2016