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What Does/Will it Mean to be a Gravitational Wave Astronomer? Reflections from an Instrumentalist

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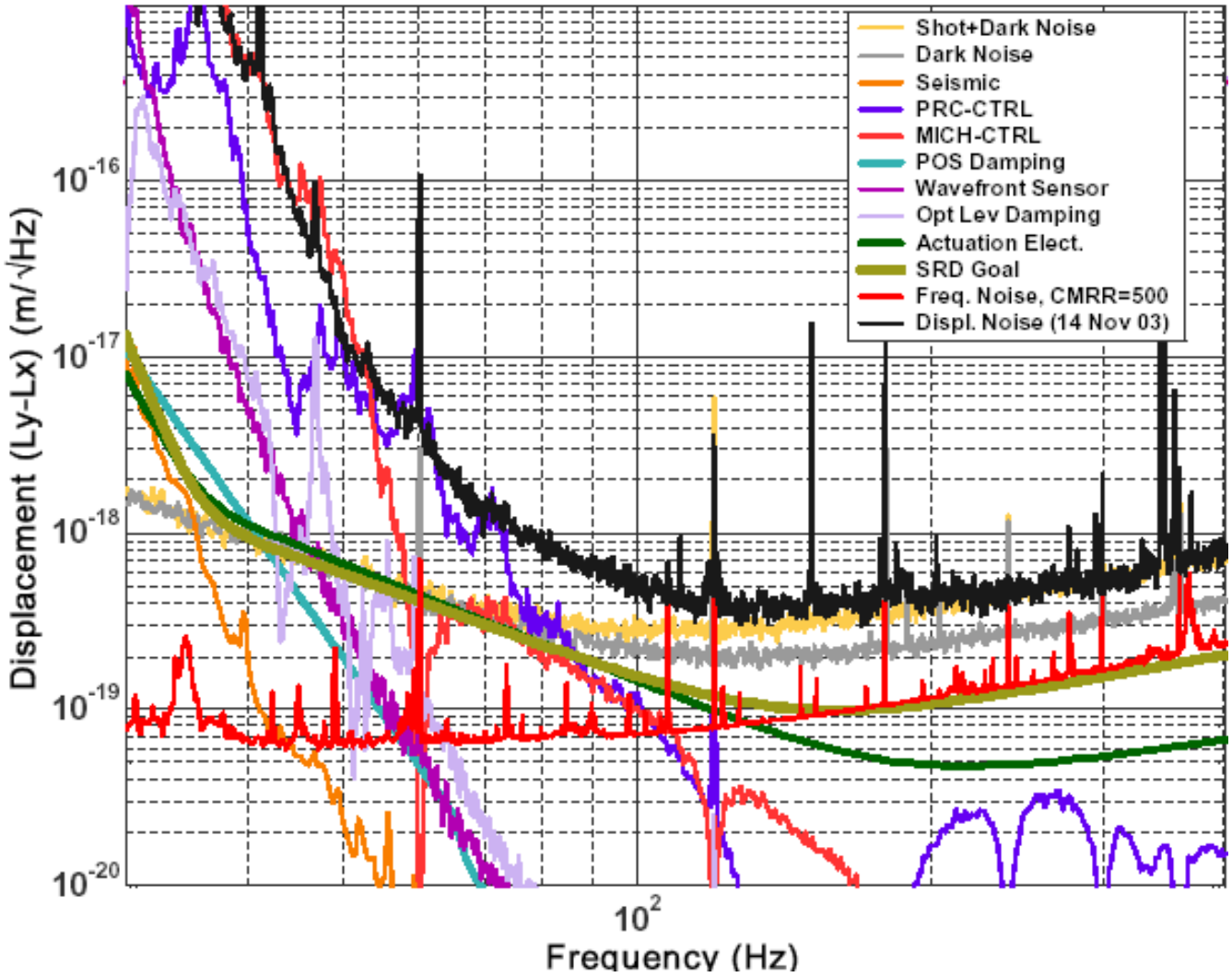
What Defines a GW Astronomer Now?

- Member of consortium operating a detector system
- Participation in data taking and analysis
- Knowledge of how to build detectors/use data
  - » Calibration
  - » Instrumental artifacts
- Interest in GW detection and willingness to help
  - » LIGO Scientific Collaboration generally open to new members
- Patience!

Complexity of GW Interferometer Data



Complexity of GW Data

- Nonstationarity?
  - » Varying noise levels,
  - » Varying noise shapes
  - » Frequency dependence of calibration
- Beam Patterns
- Confusion limits?

Any Guidance from Other Astronomical Windows?

- As graduate student, I participated in the opening of the far-infrared/submillimeter astronomical window
  - » 1974-80 as a member of one of a handful of groups making observations between 40 and 600 microns
- 1975: Everyone I worked with identified themselves as a “far-IR astonomer”
  - » Why?
- 1985: None of them would have
  - » Why?

Why "Far-IR Astronomers"?

- Most scientists using far-IR observations in 1975:
  - » Built their own instruments
  - » Decided on their own observing program
  - » Developed their own calibration techniques
  - » Interpreted their own observation
- No publicly available data or instruments for use by "outsiders"
- No need for very sophisticated analyses
  - » Back of envelope interpretations sufficed
  - » No need for 1% models when calibration errors might be 40%

Why Did They Change? (and How?)

- Development of first user facilities for far-IR observations
  - » Facility detection systems for 91 cm telescope on Kuiper Airborne Observatory
- Active promotion of collaborative observing proposals between instrumentalists and non-instrumentalist astronomers
  - » Instrumentalists had to collaborate to get observing time
- Far-IR astronomers realized that their observations alone didn't answer the important questions
- More data than instrumentalists could analyze
- Instrumentalists changed in two directions
  - » Some shifted to broader based astronomers
  - » Others moved to new frontiers in instrumentation (e.g., polarimetry)

Will "GW Astronomers" become "Astronomers" in 20 years?

Forces driving in that direction:

- As GW detections become more common, outside astronomical community will become more interested in participating
- GW astronomers will start to recognize value of observations in other bands and start to perform such observations themselves
- Techniques and documentation for using GW data will become more accessible
- More data than instrumentalists can analyze (I hope!)

Will "GW Astronomers" become "Astronomers" in 20 years?

Forces opposing that direction:

- GW sources may have limited overlap with EM sources
  - » Value of joint observations will be high, but numbers may be limited
- Size of existing GW consortia makes collaboration with smaller groups on limited scope intimidating
- Existing consortia may become more "proprietary" as high sensitivity data starts to become available

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Some Personal Guesses

- Most GW researchers will not make a major shift into general astronomy
- The connections which will develop will be very valuable, but not so numerous
- The main interest in GWs will still be at the edges of detection