

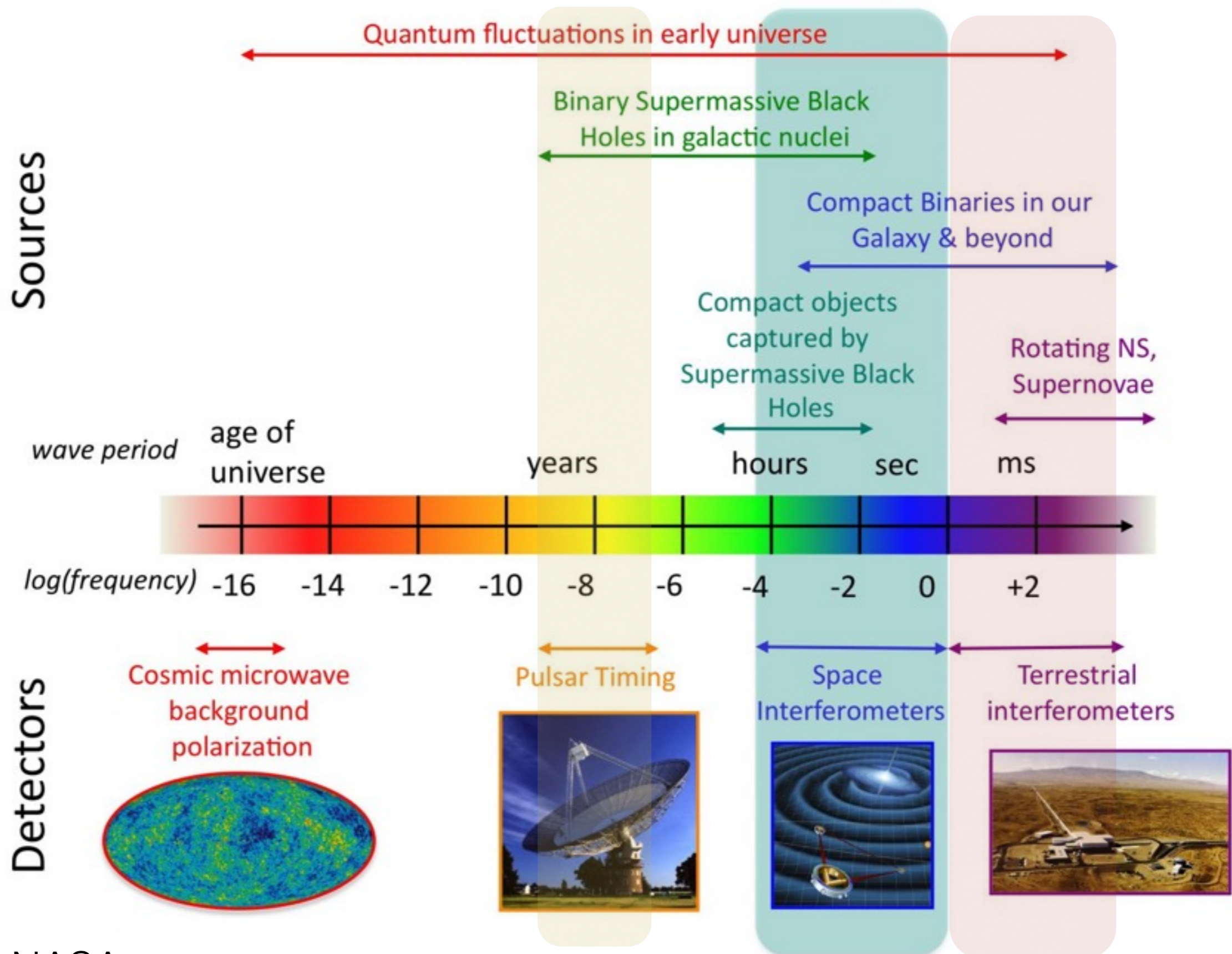
Gravitational-wave Science in the Larger Context

Beverly K. Berger
for the panel

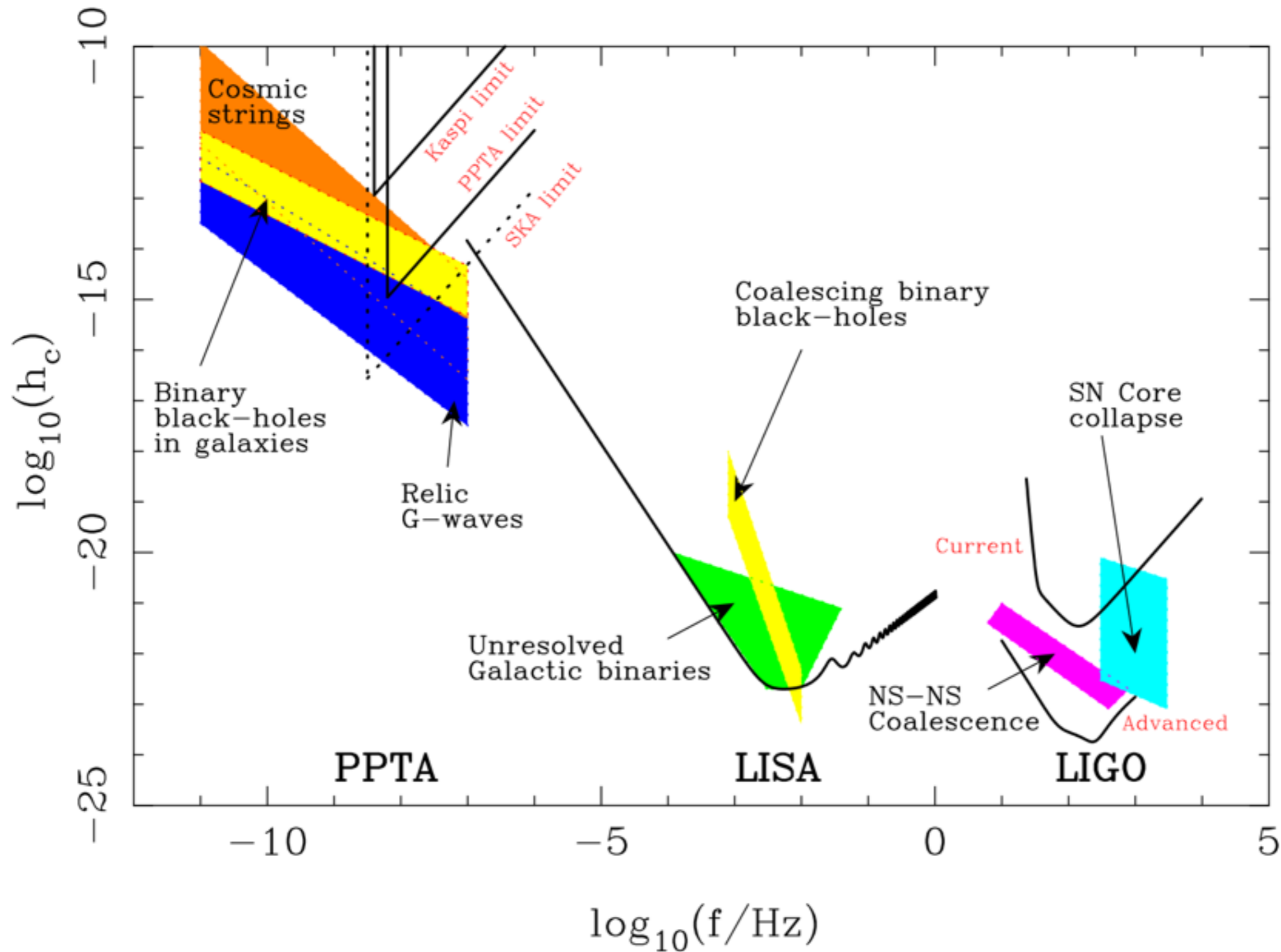
Motivation for this session

- How can GW science become more visible to the National Research Council (NRC) and other advisory bodies?
- Is there a need to have an advisory structure in GW science that reports to US funding agencies?
- What are the options for such structures?
- What are the arguments for and against them?

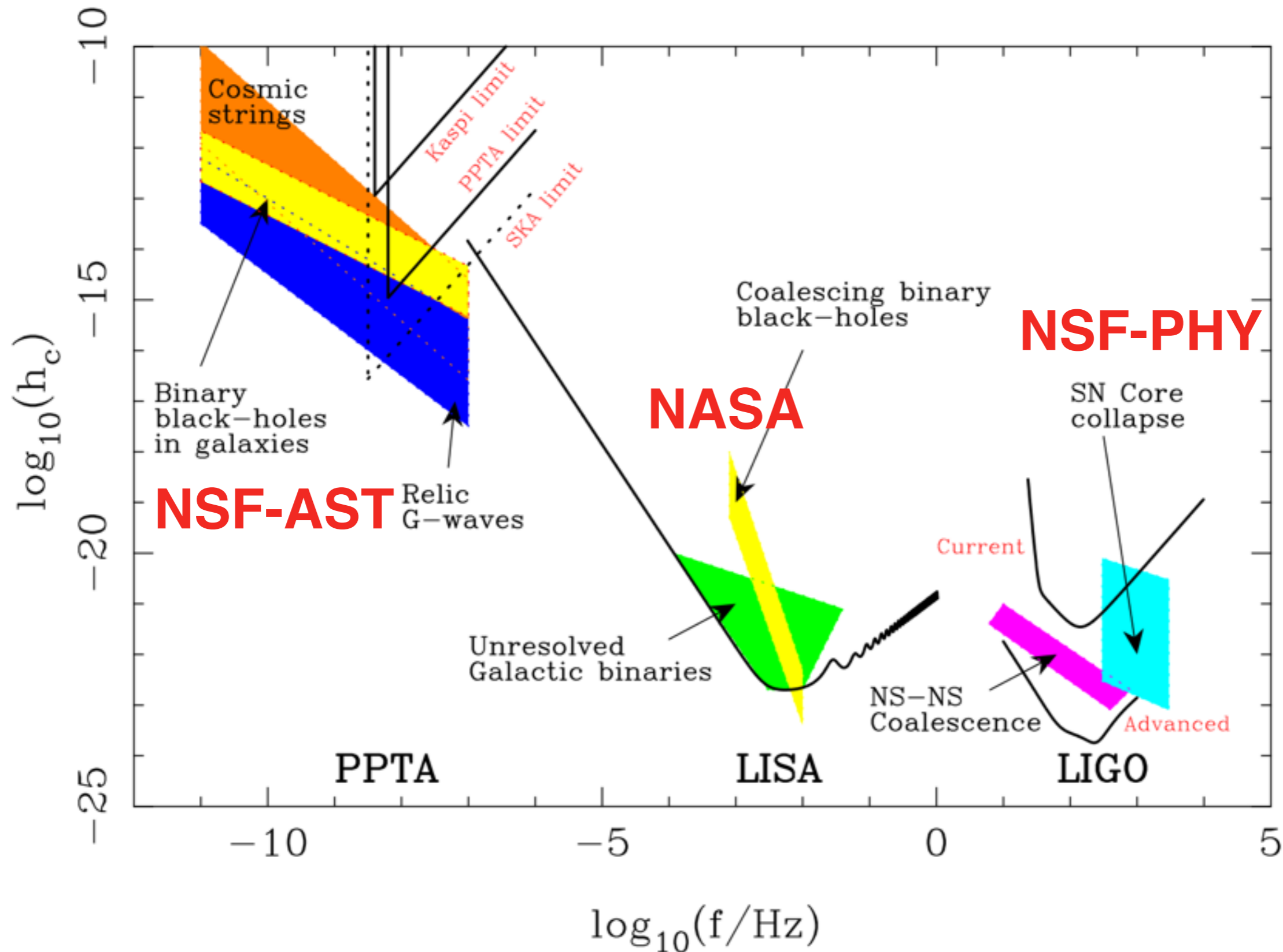
The Gravitational Wave Spectrum



US funding for GW science



US funding for GW science



US funding for GW science

- This oversimplified picture leaves out co-funding among the agencies, NSF-AST and NASA support for multi-messenger astronomy.
- DOE does not play a significant role in gravitational physics.
- CMB research is broadly funded by NSF and NASA.
- Ground-based GW detection is the only "big science" area without an advisory structure reporting to funding agencies.
- Gravitational Physics does not have an advisory structure.

Related issue

- US NSF appears to be unique in having a program in gravitational physics (GP).
- Most partner countries place ground-based GW facilities under particle astrophysics.
- NSF participation in international meetings of particle astrophysics funding agencies may not include GP program officers.
- Attention should be paid to appropriate representation of GP at such meetings.

Appropriate advisory structures existed in the past:

The path to NSF approval of initial LIGO construction required external advice using advisory structures that no longer exist.

LIGO MAGAZINE

issue 6 3/2015

Fiat Lux:
Hanford joins
Livingston
in Full Lock

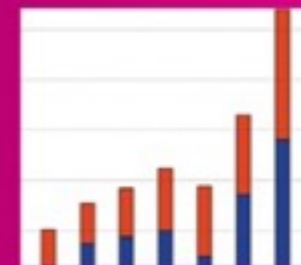
Detector Commissioning:
Control Room Days and Nights

An LHO engineer's perspective p.6



The Transition of Gravitational Physics
From Small to Big Science

Part 1: The role of the NSF and the scientific community p.14



From Rich Isaacson (formerly NSF) article in LIGO magazine:

So what does NSF do when faced with such a critical choice? It did what we always did in those days, we got advice from the scientific community. I put together a **technical review sub-committee to our advisory committee for physics....**

To start the process off, there was a discussion with the NSF **Physics Advisory Committee** about whether they found this as interesting as other exciting possibilities for the future offered by high energy physics, nuclear physics, and atomic physics.

Next, there was **consideration by a sub-panel on gravitation, cosmology, and cosmic rays ... of the decadal study** of physics priorities that the National Academy puts out.

Examples from related fields

- Interagency advisory panels — subject to Federal Advisory Committee Act (FACA):
 - HEPAP
 - NSAC
 - AAAC
- FACA makes it very difficult to set up new advisory panels.

High Energy Physics Advisory Panel (HEPAP)

<http://science.energy.gov/hep/hepap>

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Assessment of workforce development needs in Office of Science research disciplines

- * [OHEP Workforce Charge](#) (236KB) (Feb 19, 2014)
- * [OHEP Workforce Report](#) (619KB) (June 30, 2014)

Accelerator R&D Subpanel

- * [Charge Letter](#) (715KB) (June 10, 2014)

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Examples from related fields

- Board on Physics and Astronomy (part of NRC)
standing committees:
 - CAMOS
- NRC decadal surveys
 - Astronomy
 - Physics
- NRC ad hoc studies

Committee on Atomic, Molecular, and Optical Sciences (CAMOS)

http://sites.nationalacademies.org/bpa/BPA_048649

- Standing committee.
- Broad membership — all AMO areas, university, government, industry.
- Dormancy during the writing of the AMO 2010 volume of the next Physics 2010 Decadal Survey

CAMOS current objectives:

- To provide active stewardship of the agenda laid out in 2010 decadal survey
- To provide a means for dialog with federal agencies on AMO science and related fields;
- To initiate case studies on important timely topics in AMO science and/or its multidisciplinary connections with other fields of science and technology.
- To provide a venue for discussion among AMO scientists and thereby provide a unifying force in this diverse and varied field.

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Decadal Surveys

New Worlds, New Horizons in Astronomy and Astrophysics

*Committee for a Decadal Survey of Astronomy and
Astrophysics*

Decadal Surveys

- ***In Space:*** (Large-scale, in priority order) *Wide-Field Infrared Survey Telescope* (WFIRST)—an observatory designed to settle essential questions in both exoplanet and dark energy research, and which will advance topics ranging from galaxy evolution to the study of objects within our own galaxy. *The Explorer Program*—augmenting a program that delivers a high level of scientific return on relatively moderate investment and that provides the capability to respond rapidly to new scientific and technical breakthroughs. *Laser Interferometer Space Antenna* (LISA)—a low-frequency gravitational wave observatory that will open an entirely new window on the cosmos by measuring ripples in space-time caused by many new sources, including nearby white dwarf stars, and will probe the nature of black holes. *International X-ray*

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Does GW science need an advisory structure?

- Pro: After the first discoveries, issues on what to do next may require broad-based, wise input from stakeholders in the field. A structured entity could bring thoughtful deliberation to issues like priorities in next generation research, when and how to upgrade aLIGO, when and how to develop a new facility.
- Con: An advisory group does not necessarily provide wise advice; no one may pay attention; such entities can be expensive.

Should an advisory structure be standing or ad hoc?

- Standing: Always available to address urgent issues; a well functioning structure could develop credibility within the field.
- Ad hoc studies: Can respond as needed to urgent issues. Advice may not be needed on a continual basis.
- Decadal surveys: May come at the wrong time for ground-based GW science; less influential in Physics than in Astronomy; may continue to be crucial for space-based GW detectors.

Possible membership on an advisory entity

- Scientists currently working on ground-based GW detectors including data analysis and instruments
- Scientists currently working on space-based GW detectors.
- Scientists currently working on pulsar-timing.
- Astronomers and physicists in multi-messenger fields.
- Scientists in technical areas of potential interest for future upgrades or new facilities.

Discussion questions

- An advisory panel or not?
- Standing or ad hoc?
- All or part of GW science? gravitational physics?
- Report to which agencies?
- Who are the stakeholders?