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Pathways to Discovery in Astronomy and Astrophysics for the 2020s

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Realizing the Astro2020 Program: **Pathways From Foundations to Frontiers**

Explore the Cosmos

- Worlds and Suns in Context
- New Messengers and New Physics
 New Windows on the Dynamic
- Cosmic Ecosystems

- · Pathways to Habitable Worlds
- Universe
- · Unveiling the Drivers of Galaxy Growth

Forge the Frontiers

- Enable U.S. community participation in ELT program
- Develop and Implement Cosmic microwave Background S4 (joint DOE)
- Begin ngVLA design, technical demonstration, construction
- Upgrade IceCube to Gen2 (NSF/PHY)
- · Begin implementation of an Infrared/Optical/Ultraviolet large strategic mission for exoplanet exploration and general astrophysics after a successful maturation program

Enable Future Visions

Develop technology for future gravitational wave upgrades and observatories (NSF/PHY) Commence Great Observatories Missions and **Technology Maturation Program**

First entrant: IR/O/UV missions

Second entrants: Far-IR and X-ray missions

Space-Based

Sustain and Balance the Science

- Augment mid-scale programs, add strategic competitions
- Implement time domain & multi-messenger program
- · Compete probe missions in strategic areas of Far-IR and X-ray Astrophysics

Build the Foundations

- · Expand grants to bring science and ideas to fruition
- Develop and diversify the scientific workforce •
- Support data archives and curation
- Bolster theory underpinnings

Ground-Based

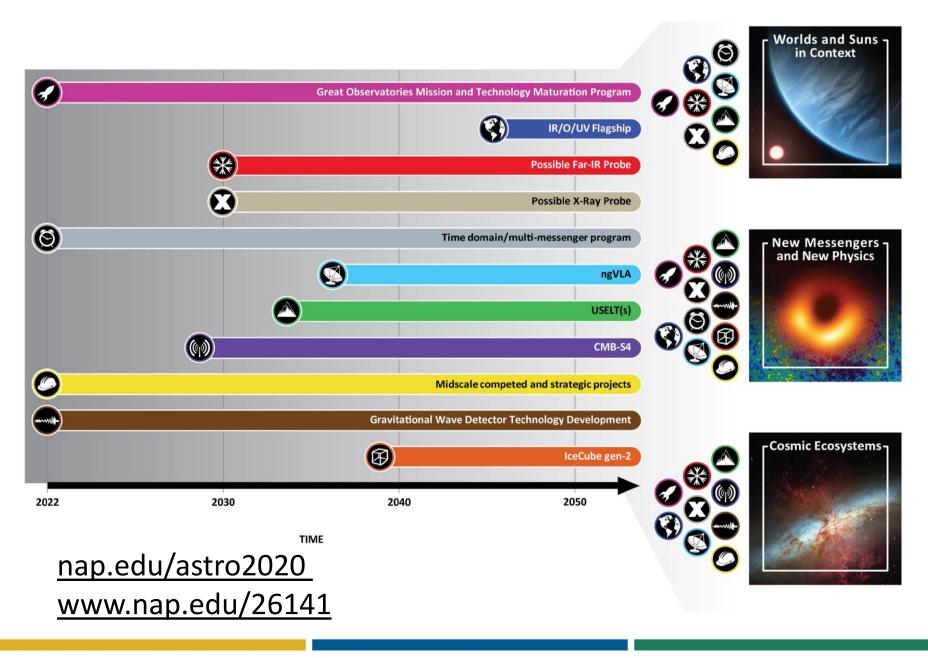
Advance crucial laboratory measurements

· Promote scientific literacy and engage the public

Expand support for early-stage and basic technology development

Guiding Principles

- · Balance the portfolio
- · Broaden and optimize the science
- Advance diversity and equity
- · Nurture sustainability



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Important Take-aways of the Pathways report:

- Taking the agencies at their urging to be *inspirational, aspirational, transformational,* but also
 - realistic, responsible, achievable, sustainable
- Interconnected nature of the science
 - Multiwavelength approach to address science questions
 - Synergies of ground & space
- Unprecedented involvement of the community
- Attention to trifecta of minds, measurements, and machines
- There is no one "winner" of the decadal we all win with this approach