APP in the Netherlands - Strategy

The CAN produced a document on “The strategic plan for astroparticle physics in the Netherlands 2014-2024”
The main objectives are achieved!

- **APP through 5 different pillars:**
  - Cosmic Rays
  - Neutrinos
  - Gamma Rays
  - Gravitational Waves
  - Dark Matter
- **A next version of this document is due**
  - Aligned with APPEC
  - Aligned with Nikhef
  - Aligned with RvA/NOVA

Science questions (in last strategy report)

What is the origin of the highest energy particles in the Universe?

What is the nature of spacetime?

What is the nature of dark matter?

What is the nature of the large-scale structure of the Universe?

What is the structure of the physics beyond the Standard Model?

Nikhef & Astronomy

Nikhef Strategy 2023 -2028

- *being finalized*

Science drivers:

- Precision Higgs physics
- Gravitational waves
- Discovery of new particles and symmetries
- Dark Matter
- Neutrinos
- Quark-gluon plasma
- Matter - antimatter differences
- Cosmic messengers
- Electron properties

ASTRONOMY in the Netherlands - Strategic plan 2021-2030

https://nova-astronomy.nl/wp-content/uploads/2023/01/Strategic-plan-2021-2030.pdf

Science questions for the next decade

Evolution of our Universe and origin of the Milky Way

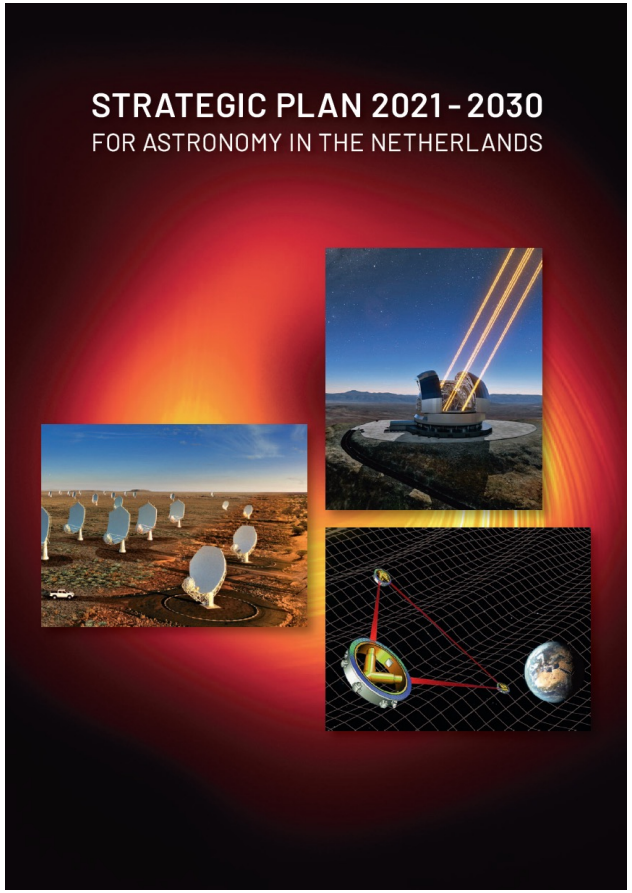
- What happened during the dawn of the Universe?
- What is the nature of the main constituents of the Universe?
- How did galaxies assemble and evolve?

Origin of Stars and planets and our place in the Universe

- How do planetary systems form around newly born stars?
- What is the diversity of exoplanetary systems?
- How do complex molecules form?
- What role does the Galactic context play?

Space and Matter under extreme conditions – The Universe as a laboratory

- To what precision can general relativity describe gravity?
- What is the nature of dense matter?
- What is the origin of the elements?
- How do compact objects form and evolve?
- How do compact objects produce energy and accelerate particles?



European Context

ASTRONET

https://www.astronet-eu.org/

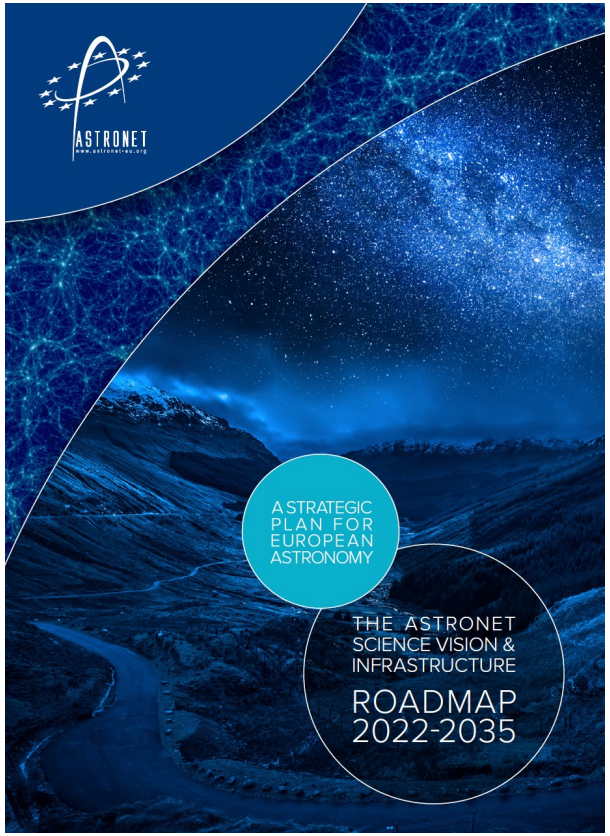
Roadmap for European Astronomy

Scientific priorities

The strategic Roadmap for the next decade of European Astronomy is based on the scientific aspirations of the community to answer fundamental questions about our Universe, the most pressing being:

- What is the nature of dark matter and dark energy?
- Are there deviations from the standard theories and models (general relativity, cosmological model, standard model of particle physics)?
- What are the properties of the cosmic microwave background, first stars, galaxies and black holes in the Universe?
- How do galaxies form and evolve, and how does the Milky Way fit in this context?
- What are the progenitors of astronomical transients?
- What physical and chemical processes control stellar evolution at all stages, from formation to death, and how?
- What are the necessary conditions for life to emerge and thrive? Are we alone?
- How do planets and planetary systems form and evolve?
- What is the impact of the Sun on the heliosphere and on planetary environments?
- What are/were the characteristics and habitability of various sites in the solar system, such as Mars or Jupiter's icy moons?
- What is the origin of cosmic rays of all energies?
- How can extreme astrophysical objects and processes probe new fundamental physics?

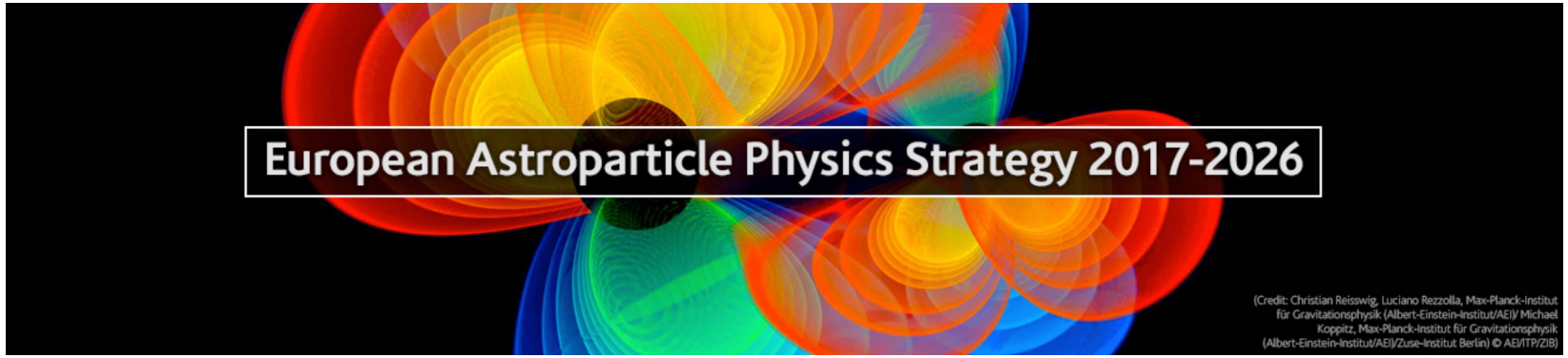
γ-ray: CTA
Neutrinos: KM3NeT
GW: ET, LISA



'The ecosystem of European infrastructures needs to be balanced and synergised, in order to deliver the best science.'

***Future* facilities:**

γ-ray: **CTA**, *SWGO*
Neutrinos: **KM3NeT**, *RNO-G*
Cosmic rays: **Auger-Prime**, *GRAND, GCOS, POEMMA*
GW: **ET, LISA**
Dark matter: ***XLZD?***



- **The Extreme Universe:**

What can we learn about the cataclysmic events in our Universe by combining all of the messengers – high energy gamma rays, neutrinos, cosmic rays and gravitational waves – that we have at our disposal?

- **The Dark Universe:**

What is the nature of Dark Matter and Dark Energy?

- **Mysterious neutrinos:**

What are their intricate properties and what can they tell us?

- **The Early Universe**

What else can we learn about the Big Bang – for instance, from the cosmic microwave background (CMB)?

Large Infrastructures

Structural investments needed

- Permanent Committee for Large Scientific Infrastructures (~40M€/year), >10M€ / proposal
  2 slots / 2 years for particle physics & astronomy & astroparticle physics
- NWO-XL / Zwaartekracht / (ERC)
  - Science
- Nationale Groeifonds -> Einstein Telescope (42M€ + 870M€ earmarked)
  - Economy driven, regional impact
- Membership costs