

- Rosario Aiello
- Maria Teresa Capria
- Romilda Cozzolino
- Andrea Di Dato
- Mauro Gargano
- Andrea Maiorica
- Corrado Perna



DVS-Recommendations

Recommendations are **not intended as the only goals** that INAF should pursue in the future, but as **goals that are of special relevance** and should not be missed, together with other important activities, small-scale extremely innovative high-risk high-gain projects and the unceasing unforeseen breakthroughs that make Science a surprising and exciting discipline.

Projects with a significant future technological involvement of INAF

Project	Key Question	Method	Future INAF technological contribution
SKA	Processes that determined the formation and evolution of the Solar System	Observations of primitive bodies, exoplanetary systems (dust aggregation processes, formation processes)	Antenna systems Heat rejecter Phased Array Feeds Front end optical transmitter and receiver Analogue fiber optical RF/ RFoF UAV Digital back-end Readout Electronics Real time SW Control SW Big Data Data analysis infrastructures
	Proto-planetary discs: initial conditions for the formation of planets	Formation and evolution of disks: solids from dust to planets, gas content, dissipation, chemical evolution of complex organic molecules, wind properties from thermal free-free and radio lines. Magnetic field orientation and amplitude around jet/disks. Disk-star-planet interaction	
	Evolutionary processes giving origin to the emergence of life	Observation of primitive bodies (organic material and ices)	
	Taking stellar models to the next power	Comparison of magnetic fields measurements with model predictions	
	Physics of accretion and ejection onto/from compact objects	Observations of galactic and extragalactic compact objects	
Equation of state of nuclear matter and “strange” stars; Pulsars; compact binary systems	Measurements of periods and period derivatives, moments of inertia of compact stars		

and 32 pages more...

1) A new program to **support specifically Theoretical Astrophysics.**

Every participation to a new project or facility should involve a commensurate number of theorists and interpretative astrophysicists to ensure a an adequate scientific return for the Italian community.

2) Considering the very long development/construction times, adequate **roadmaps** should be defined in order to **maintain the scientific expertise of the already well-established groups at international level** over such long periods and to train/form the scientists that will design, build and exploit the big facilities/missions of the future. This requires an adequate and carefully tuned balance between long term and short term projects.

3) **Support “free research” projects.** Besides the large projects it is important to support scientific and technological projects small in size but with important scientific return, curiosity driven research with funding schemes including PRIN (Research Projects of National Interest) and rolling grants.

Regular (i.e. with a well-defined and known timeline, as well as consolidated rules) **emission of competitive calls for scientific and technological research projects.**

Reinforce links between INAF and University departments – systemic approach.

4) Support and expand the role of INAF in ESO,
aiming at a leadership role comparable to other major European nations, in particular for the development of advanced instrumentation of the ELT.

5) **Multimessenger astrophysics.** Contribute to this new field, with increasing effort and resources, especially supporting the aspects that are more relevant for the experience of the INAF scientists (e.g. electromagnetic follow-up, theoretical astrophysics, development of new facilities/satellites for e.m. observations).

National level: close collaboration with other major players (INFN, ASI, University groups)

International level (ESA, ESO...): combined effort to coordinate the INAF contribution and support the most promising groups.

6) Promote and develop joint efforts aimed at enhancing interdisciplinary, convergent research in astronomy and astrophysics within INAF (i.e. across the different National Research Groups).

e.g. Solar System research and the astrophysics of planetary systems (chemistry, geology, biology, and computer science).

Promote and develop collaborative schemes aimed at fostering interdisciplinary partnerships between INAF researchers and colleagues in other organizations and laboratories.

7) Foster an **improved cooperation between INAF and the Italian Space Agency**, based on the respective specificity and complementarity, following clear and transparent rules. INAF should be involved in all the phases of the participation of its researchers to a space mission, from the proposal preparation to the building of instruments/software and the exploitation of the data. INAF should take part in the approval process of a proposal for the scientific participation to a mission team and/or the building of an instrument, and then contribute with ASI in giving support to the involved team.

Goal: an **international leadership role comparable to other major European nations**.