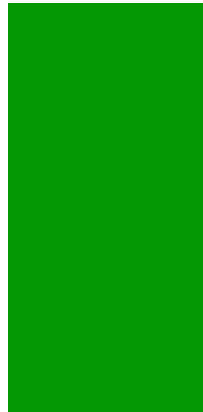


ITALY



The Management of Italian Astrophysics

An overview of the organisation of the research system in Italy

The Italian research activities are essentially public, and most of the funds for research infrastructures and universities are provided by the Italian State.

According to the prescriptions of the Law 9 May 1989, n.168 and successive decrees, the public scientific research is performed and managed by public bodies, institutes, universities and funding agencies. They, independently, carry out their scientific, managerial and accounting activities, but, follow the strategic guidelines of the government that supervise the activities.

In this scenario, the government still has an addressing, funding and supervising power on these public bodies, still playing a fundamental role in planning the research policy and allocating the funds.

The general specifications are indicated in a document, the 'Guidelines for Scientific Research and Technology of the Government', drawn up by the Council of Italian Ministers. National research policy and priorities are, generally, established in two strategic pluriannual documents described below.

PNR - Programma Nazionale di Ricerca

The *Programma Nazionale di Ricerca* (National Programme of Research) is a three-year national operational planning document for research activities drawn up by the Ministry of Education, University and Research (MUR) (see chart for details). It is based on the government policy on research and technology and to be approved by CIPE – *Comitato Inter-ministeriale per la Programmazione Economica* (Inter-Ministerial Committee for Economic Planning)

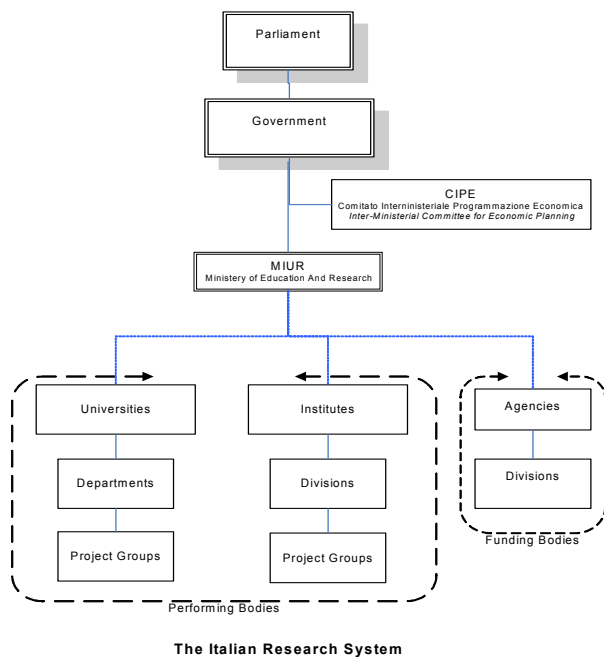
before becoming operative, since it also addresses the allocation of financial resources to support research projects. Currently, the PNR 2005-2007 is being implemented.

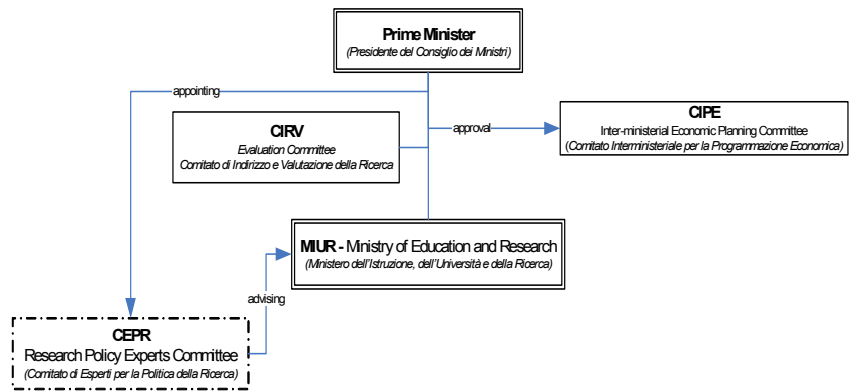
PON - Piano Operativo Nazionale

The *Piano Operativo Nazionale* (National Operational Plan) governs the national planning of the European funds, the so called Structural Funds. These are the European funds administered by the Italian public authorities to strengthen the research activities in some of the Italian regions.

Other ministries, such as the Ministry of Industry, the Ministry of Agricultural and Forestry Policies, the Ministry for the Environment and the Ministry of Health, develop research policies in their respective fields of activities. An important role in funding astronomy is played by the Ministry of Foreign Affairs.

The Italian government has also recently launched a policy of supporting the development of Technological Districts, the promotion of new Centres of Excellence and Scientific and Technology Parks. In the next figures, the organisation chart of the national research system, and of the PNR are graphed.

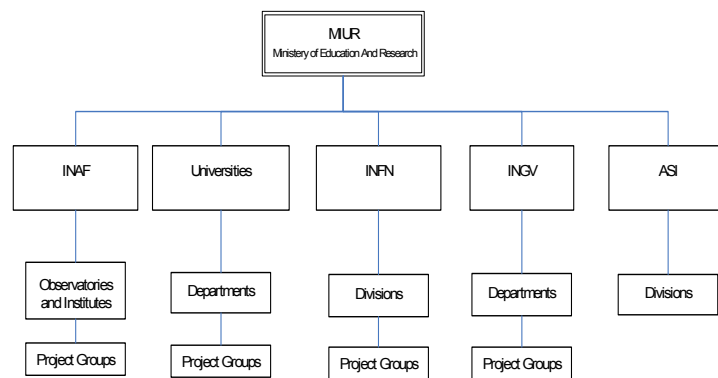




The National Research Plan is drawn up by the Ministry of Education and Research which can be supported, if needed, by the CEPR whose members are appointed by the Prime Minister.

4.1 The Players in Italian Astronomy and Astrophysics

Recently, the entire astronomy and astrophysics domain has been deeply revised through the creation of the **INAF** - *Istituto Nazionale di Astrofisica* (National Institute for Astrophysics) and the reorganisation of the **ASI** - *Agenzia Spaziale Italiana* (Italian Space Agency). In particular, INAF has been created by merging into a single body all the astronomical observatories as well as some of the research institutes, formerly, belonging to **CNR** - *Consiglio Nazionale delle Ricerche* (National Research Council). Departments of Astronomy or Physics of many universities are very active in astrophysical research, as well as institutes with different concerns as the **INFN** - *Istituto Nazionale di Fisica Nucleare* (National Institute for Nuclear Physics) and the **INGV** - *Istituto di Geofisica e Vulcanologia* (National Institute of Geophysics and Volcanology)



The main bodies involved in Astrophysics

4.1.1



Istituto Nazionale di Astrofisica

The Legislative Decree no. 296 of July 23, 1999 and the Decree no. 38 of June 2003 established the foundation of a new public body, the National Institute for Astrophysics (INAF), which links together all the structures that perform astronomy and astrophysics research, including the 12 astronomical and astrophysical observatories and three institutes, formerly, belonging to CNR.

The Law defines mission, activities, statutory bodies, organisational and functional principles and criteria with the purpose of promoting and linking operating structures of excellence, preventing duplication of similar institutional entities and guaranteeing the maximum level of flexibility, autonomy and effectiveness.

INAF research activities include the study of the Universe through astronomical observations and the experimental and theoretical understanding of the structure, composition and evolution of celestial objects. INAF is active in space and ground-based astronomy at any wavelength and in the study of cosmic rays and of gravitational waves. Its primary aims are:

- support of the basis research in astrophysics and astronomy;
- development of innovative technology for space and ground instruments;
- participation in international projects and realization of innovative facilities
- development and management of observational facilities (the

main being TNG, a network of 12 small optical telescopes, three radio antennas and, in the near future, LBT and SRT)

INAF INSTITUTES		
Institute	P	NP
<i>Osservatorio Astronomico di Arcetri</i> (Astrophysical Observatory of Arcetri)	42	33
<i>Osservatorio Astronomico di Bologna</i> (Astronomical Observatory of Bologna)	37	18
<i>Osservatorio Astronomico di Brera</i> (Astronomical Observatory of Brera)	31	17
<i>Osservatorio Astronomico di Cagliari</i> (Astronomical Observatory of Cagliari)	17	10
<i>Osservatorio Astronomico di Capodimonte</i> (Astronomical Observatory of Capodimonte)	31	24
<i>Osservatorio Astronomico di Catania</i> (Astrophysical Observatory of Catania)	27	11
IASF <i>Istituto di Fisica Cosmica e Fisica dello Spazio</i> (Institute of Cosmic Physics and Space Astrophysics – Bologna)	31	22
IASF <i>Istituto di Fisica Cosmica e Fisica dello Spazio</i> (Institute of Cosmic Physics and Space Astrophysics – Milan)	17	22
IASF <i>Istituto di Fisica Cosmica e Fisica dello Spazio</i> (Institute of Cosmic Physics and Space Astrophysics – Palermo)	16	5
IASF <i>Istituto di Fisica Cosmica e Fisica dello Spazio</i> (Institute of Cosmic Physics and Space Astrophysics – Rome)	37	30
IFSI <i>Istituto di Fisica dello Spazio Interplanetario</i> (Institute of Interplanetary Space Physics – Rome)	28	29
IFSI <i>Istituto di Fisica dello Spazio Interplanetario</i> (Institute of Interplanetary Space Physics – IFSI Turin)	12	3
IRA <i>Istituto di Radioastronomia</i> (Institute of Radio Astronomy - IRA Bologna) (Institute of Radio Astronomy - IRA Florence) (Institute of Radio Astronomy - IRA Noto)	42	19
<i>Osservatorio Astronomico di Padova</i> (Astronomical Observatory of Padova)	40	23
<i>Osservatorio Astronomico di Palermo</i> (Astronomical Observatory of Palermo)	13	11
<i>Osservatorio Astronomico di Roma</i> (Astronomical Observatory of Rome)	42	39
<i>Osservatorio Astronomico di Teramo</i> (Astronomical Observatory of Teramo)	7	9
<i>Osservatorio Astronomico di Torino</i> (Astronomical Observatory of Turin)	27	11
<i>Osservatorio Astronomico di Trieste</i> (Astronomical Observatory of Trieste)	34	20

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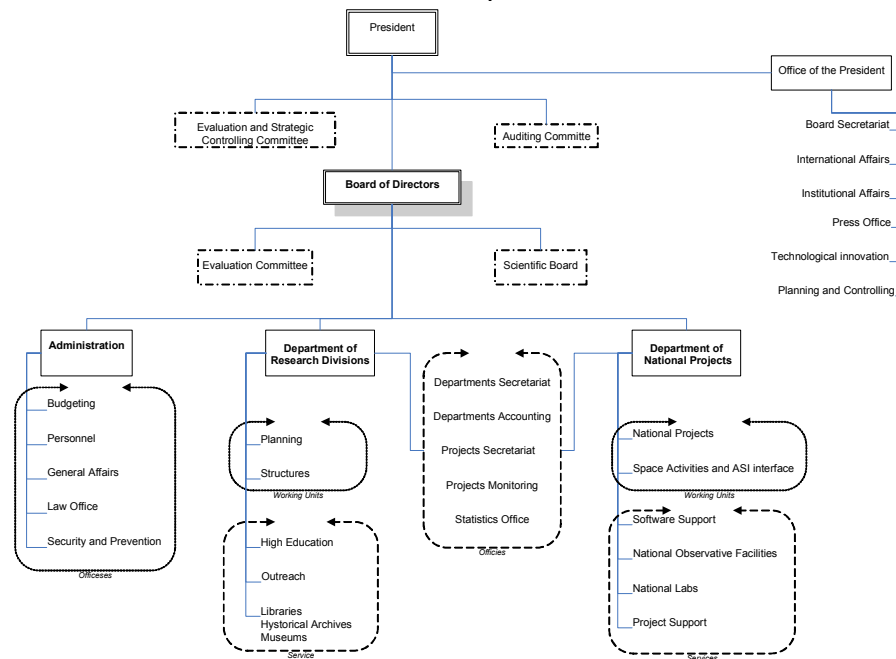
- promotion of training and technical-professional advancement of Italian researchers through scholarships and research grants;
- public outreach

Today, more than 500 full-time astronomers work within INAF, among 20 different institutes and observatories.

INAF MAIN FACILITIES	
TNG	<i>Telescopio Nazionale Galileo</i> (Galileo National Telescope, La Palma – Canary Islands)
LBT	<i>Large Binocular Telescope, Arizona</i>
VLT	<i>VLT Survey Telescope</i>
REM	<i>Rapid EYE Mount</i>
THEMIS	

The INAF Management

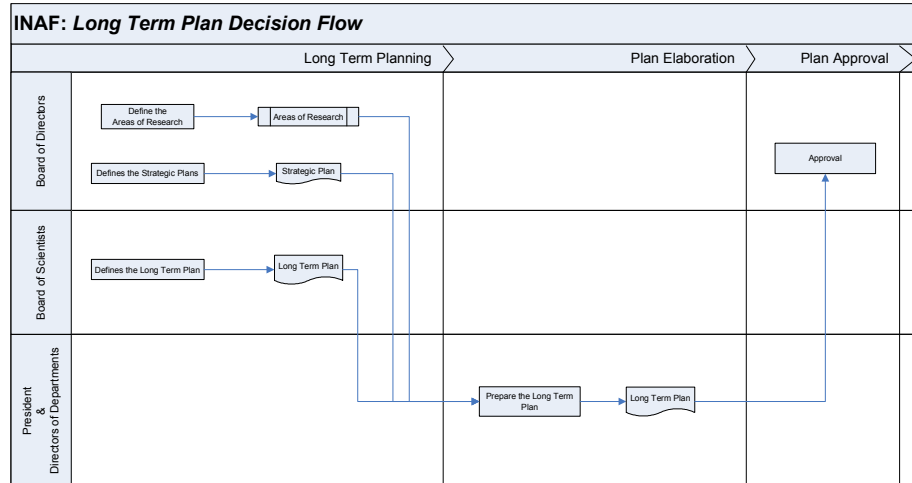
The current organisation of the Institute, as described in the chart shown below, envisions a governing board that consists of the President and the Board of Trustees, appointed by the government, *Consiglio dei Ministri* (Council of Ministers) on the recommendation of the *Ministro dell'Università e della Ricerca* (Minister of Education and Research). Their mandates last four years and can be renewed once.



INAF organisation chart

The Board of Trustees appoints the executive management, namely, the Directors of the departments and the Directors of the observatories and the institutes, subject to the approval of the Board of Directors.

The research activities are planned on the basis of the long-term scientific and strategic plans shown in the figure below.



4.1.2



Agenzia Spaziale Italiana

The Italian Space Agency has the goal of preparing and putting into effect the National Space Program that addresses the strategic choices of the country in the field of space research.

A primary goal of ASI is to fund the Italian participation to the ESA, of which Italy is the third country, in terms of the amount of financial contributions. In this context, ASI funds both the mandatory programs as well as the optional program. The ASI, also, has a strong tie of collaboration with NASA, for example, in the construction of the International Space Station, and participates in

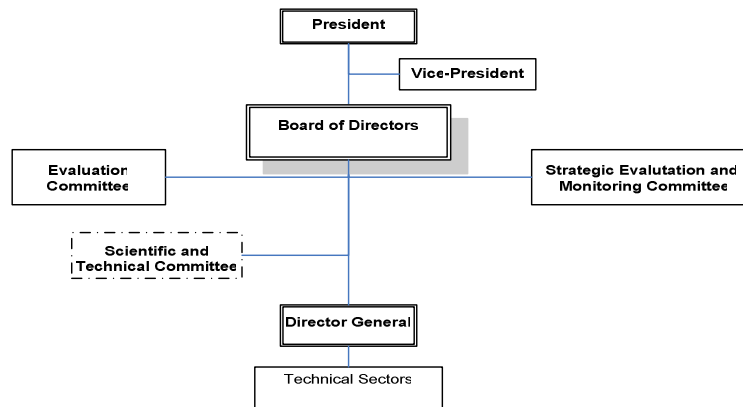
ASI FACILITIES
<i>Centro di Geodesia Spaziale "Giuseppe Colombo"</i> (Giuseppe Colombo Space Geodesy Center)
I-PAF <i>Infrastruttura per il processamento, archiviazione e distribuzione di dati telerilevati da satellite</i> (The Italian Processing and Archiving Facility)
<i>Base di Lancio "Luigi Broglio"</i> (Luigi Broglio Launch Pad for stratospheric balloons)
ASDC – ASI Science Data Center

many international programs, such as the exploration of Mars. In addition, ASI funds both astronomical and applied research in the field of astrophysics. The ASI executes the national space program by:

- projects planning
- funding research projects and missions through the science, technology and industry communities throughout the country.

The ASI Management

The Agency is led by a President and a Board of Directors appointed by the government and the mandate lasts four years and can be renewed only once. The general management of the Agency is described in the following figure.



The planning of astronomy activities is performed by the Unit “Observations of the Universe” of ASI, which is actually involved in several national and internationally shared programs.

4.1.3



The Universities

Universities in Italy provide teaching and research activities. In conformity with the principle of the autonomy of universities, each university draws up its own statutes and its own internal regulations.

Six Italian universities have Departments of Astronomy and/or Astrophysics in their Science Faculties, where many research groups in various fields are present. Many other Departments of Physics also have research groups in astronomy. Most universities award Ph.D. doctorates in astronomy and/or astrophysics.

The Universities Management

The universities’ statutes establish the rules for its administration, teaching and research through:

Faculties

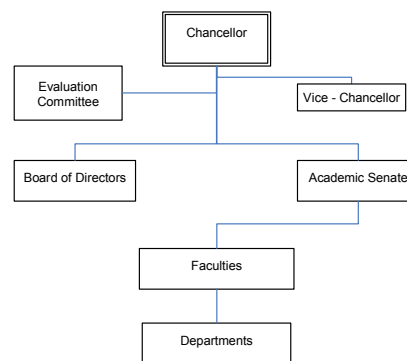
which co-ordinate the teaching of the various degree courses, appoint academic staff and decide their roles and activities. Faculties are administered by Faculty Councils and the Deans

Departments

which organise research in line with the teaching that is carried out, promote and manage research, organise Ph.D. courses and engage in research and consultancy activity outside the university. Departments are administered by Department Councils and the Directors

Institutes

which deal with the specific scientific sectors to which their teaching belongs and in which research is conducted. Institutes are administered by Councils and the Directors



Universities with Astronomy and Astrophysics Departments	
University	Department
<i>Università dell'Aquila</i>	Physics
<i>Università di Bologna</i>	Astronomy
<i>Università of Cagliari</i>	Physics
<i>Università of Calabria</i>	Physics
<i>Università of Catania</i>	Physics and Astronomy
<i>Università di Ferrara</i>	Physics
<i>Università degli Studi di Firenze</i>	Astrophysics and Space Sciences
<i>Università di Genova</i>	Information Technology

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<i>Università di Lecce</i>	Physics
<i>Università di Messina</i>	Physics
<i>Università di Milano</i>	Physics
<i>Università del Molise</i>	Earth and Environmental Sciences
<i>Università di Milano "Bicocca"</i>	"G. Occhialini" Physics Dept.
<i>Università di Napoli "Federico II"</i>	Physics
<i>Università di Napoli "Parthenope"</i>	Applied Sciences
<i>Università degli Studi di Padova</i>	Astronomy
<i>Università di Palermo</i>	Physical Sciences and Astronomy
<i>Università di Parma</i>	Earth Sciences
<i>Università di Pavia</i>	Physics
<i>Università di Perugia</i>	Physics
<i>Università di Pescara-Chieti "D'Annunzio"</i>	IRSPC
<i>Università di Pisa</i>	Physics
<i>Università di Roma "La Sapienza"</i>	Physics
<i>Politecnico di Milano</i>	
<i>Università di Roma "Tre"</i>	Physics
<i>Università di Roma "Tor Vergata"</i>	Physics
<i>Università di Salerno</i>	Physics
<i>Università di Teramo</i>	Physics
SISSA	Astrophysics
<i>Scuola Normale Superiore di Pisa</i>	Physics
<i>Università di Torino</i>	Physics
<i>Udine</i>	Physics
<i>Università della Tuscia</i>	Physics

4.1.4



Istituto Nazionale di Fisica Nucleare

The National Institute of Nuclear Physics is traditionally devoted to research on nuclear and subnuclear studies, and performs experimental and theoretical activities in this field using its own facilities or international facilities such as CERN.

Within INFN, astroparticle physics has been attracting resources in these last years and INFN is investing many forces in this research domain, with a particular emphasis on high-energy astrophysics, cosmic rays, gravitational rays, cosmic microwave background and theoretical investigations of the early Universe.

Research activity at the INFN is carried out at two complementary types of facilities: the Divisions (Sezioni) and the National Laboratories. Each of the 19 Divisions are located at a university physics department. The Divisions, thus, provide a direct connection between the Institute and the academic world. The four Laboratories—in Catania, Frascati, Legnaro, and at Gran Sasso—are home to major facilities which are available to the national and international scientific community.

The INFN workforce includes about 2,000 of its own employees, almost 2,000 university employees involved in research conducted by the Institute, and 1,300 young researchers, including undergraduate and graduate students and research fellows. The organisation of the INFN represents an effective balance between centralized and decentralized management



and is the product of customs established and strengthened over the years. The main decisional body of the Institute is the Council of Directors, comprised of the President and the Executive Board; the Directors of the four National Laboratories and 19 Divisions; and representatives from other institutions.

2.1.2



Istituto Nazionale di Geofisica e Vulcanologia

The INGV, National Institute Geophysics and Volcanology, is the national institute involved in the geophysical domain. The main research activity is on earthquakes and volcanology. It, in fact, is also in charge of the national earthquakes detection system and plays an important role through the activities of the Institute in the research on high atmospheric and solar phenomena and space weather.

4.2 The Italian Astronomy @ Main European Organisations

4.2.1



The ESA membership

The funding for the Italian membership to ESA is fully covered by ASI. The Italian representation at the ESA decisional boards are shown in the following table:

@ ESA Boards	
ESA BOARD NAME	APPOINTING INSTITUTION
Ministerial Level Council	Ministry of Education and Research
Council	President of the ASI
SPC	Members appointed by ASI

4.2.2



The ESO membership

The funding for the Italian membership at ESO is directly provided by the Ministry of Foreign Affairs (*Ministero degli Affari Esteri*). The Italian representation at the ESO decisional board is shown in the following table:

@ ESO Council	
POSITION	APPOINTING INSTITUTION
Political Member	Ministry of Foreign Affairs
Scientific Member	Ministry of Education and Research *

* The Ministry appoints the Scientific Member after an informal consultation with the Astronomical community through INAF.

4.3 The Funding

The Italian research public funding system is based on these main guidelines:

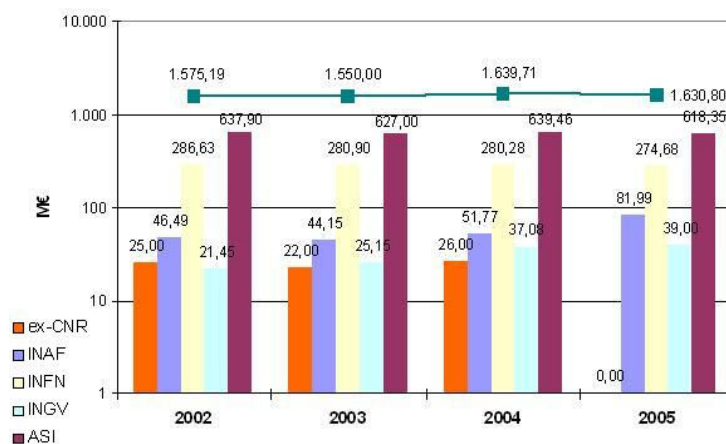
- governmental funds are provided without any pre-defined destination, allocated directly to the public bodies (such as INAF, ASI or INFN), to be used for both structures maintenance (personnel, buildings, etc...) and for funding research projects;
- targeted funds are provided to support projects in specific research areas on a competitive basis, according to the guidelines of the PRN - *Programma di Ricerca Nazionale* (National Research Program);
- EU funds;
- regional and local funds.

The first type of funds, often called FFO – *Fondo di Funzionamento Ordinario* (Ordinary Working Fund) is of competence of the Ministry of Education and Research while the others are allocated by the proposing ministries.

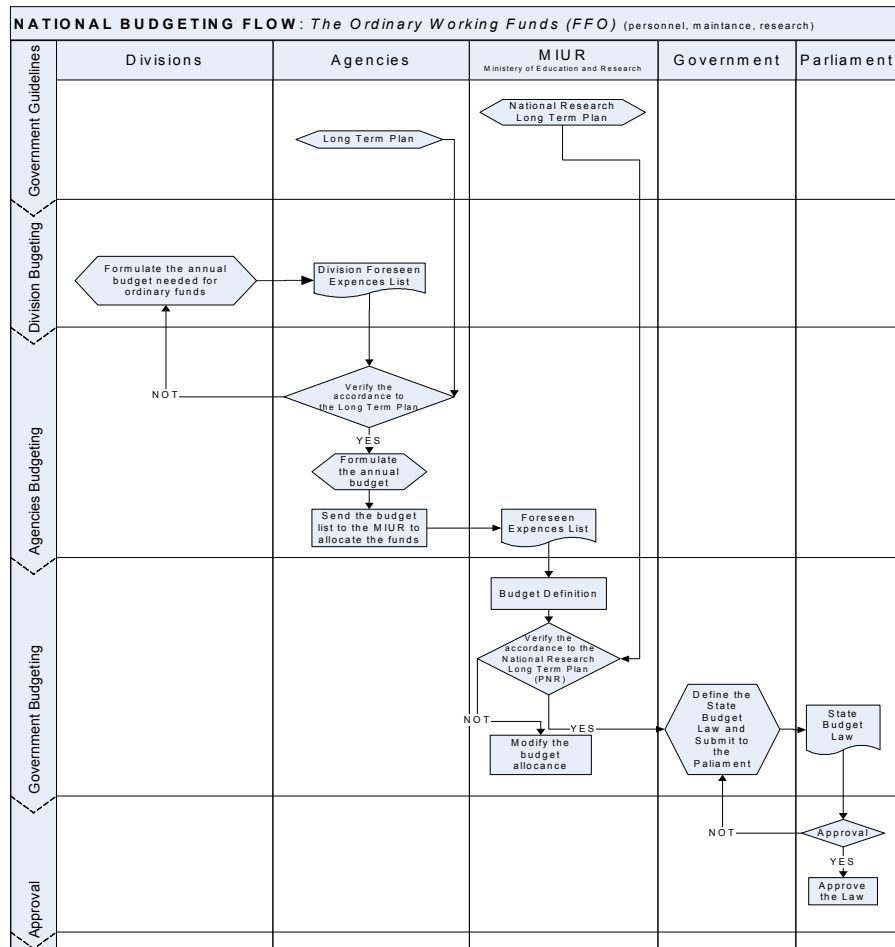
The core funding

The FFO is the core of the national research funding: it guarantees the basic working operations of the research institutes and support for the research. Unfortunately, the percentage devoted to research has kept decreasing over the last years.

The process of reaching the definition of the amount of money to allocate on this fund is a result of a bottom-up consultation process that takes into account the foreseen expenses of the institutes and the universities.



FFO Distribution. Note that in 2005 three institutes (ex-CNR) were merged into INAF. The green line shows the total amount of funds for all the national research bodies under the authority of the Ministry, that are more than the ones shown in the chart



4.3.1



Ministero dell'Università e della Ricerca

The Ministry of Education and Research is the major funding body in the Italian research system. Currently, it allocates integrative funds through targeted competitive calls open to all in the community. In the following table is shown the different types of calls performed by the Ministry.

Ministry of University and Research		
Fund Name	Objectives	Amount
PRIN <i>Progetti di Rilevante Interesse Nazionale</i> (Projects of Relevant National Interest)	<p>The PRIN programme is the principal fund for projects of academic research.</p> <p>Every year the MUR co-finances research projects of relevant national interest proposed by universities and public bodies. They have a duration of one year or two years.</p> <p>The applications for co-funding of the PRIN projects presented to the MUR must be in line with precise scientific subjects that are freely chosen but deal with previously established topics. This makes the PRIN the fundamental instrument for the funding of the basic research of universities.</p>	2.6
FIRB <i>Fondo Integrativo Ricerca di Base</i> (Supplementary Fund for Basic Research)	<p>The fund supports defined basic research activities with activities that aim at a broadening of scientific and technical knowledge that is not connected with specific and immediate industrial or commercial objectives.</p> <ul style="list-style-type: none"> • Projects for the strengthening of the major research infrastructures. • Basic research projects proposed by bodies and universities. • Strategic development projects involving pervasive and multi-sectorial technologies. • The creation of highly qualified scientific centres. 	2.0
FISR <i>Fondo Integrativo Speciale Ricerca</i> (Special Supplementary Fund for Research)	<p>Fund for financing of specific measures of special strategic relevance.</p> <p>The FISR co-finances up to a maximum of 70% of the total budgets of projects presented on subjects connected with the National Research Programme (PNR).</p>	n/a
FAR <i>Fondo Iniziative di Ricerca</i> (Fund for Research Incentives)	<p>The FAR programme co-finances projects of activities involving applied research (industrial research and innovation) on specific subjects. The project must be marked by a strong involvement of ICT and new technological processes, in particular for industries or networks of small or medium-sized businesses.</p> <p>The indicators for the assessment of projects are:</p> <ul style="list-style-type: none"> • Consistency with the subjects given. • The degree and form of involvement of ICT companies. • The originality and innovation of the final product developed. • The quality and suitability of the research structures. • The reliability of the economic-employment consequences of the project. 	n/a



The Ministry of Economical Development provides funding towards research that may have a technological spin-off.

The following table shows the current available funds.

Ministry of Economical Development		
Fund Name	Objectives	Amount
FIT <i>Fondo Iniziative Tecnologiche</i> (Rotating Fund for Technological Innovation)	Programmes to encourage pre-competitive development activities (that is to say the planning, experimentation with, development and pre-industrialisation of new products, and thus the implementation of pilot projects or prototypes), which can also include activity that is not preponderantly to do with industrial research or activity to foster the creation, broadening, modernisation, restructuring, conversion, reactivation, acquisition, or relocation of research centres, can receive these incentives.	n/a
FSSRIS <i>Fondo Speciale per lo Sviluppo della Ricerca d'Interesse Strategico</i> (Special Fund for the Development of Research of Strategic Interest)	Programmes to encourage development R&D in industrial strategic area	n/a

4.3.2

Istituto Nazionale di Astrofisica

Within the INAF budget, a fraction of less than 10% is devoted to the funding of research projects. In 2005, part of this research budget has been allocated directly to the Directors of each observatory and institutes to fund small-sized projects. Another part has been allocated to a nation-wide competitive call for projects, open also to researchers from universities and other bodies.

A third part has been dedicated to funding postdoc positions, with no pre-defined allocation to research projects. Finally, another part has been assigned to maintain and develop large projects and national infrastructures, selected according to the following evaluation flow.

INAF Funding (2005)		
Running cost + salaries	Infrastructures	Research Grants
77.5	6.4	4.5

4.3.3

Agenzia Spaziale Italiana

At variance with INAF, ASI devotes most of its budget to fund specific projects in all sectors of space science and technology. Currently, ASI does

not issue any open calls on a competitive basis, but directly assigns funds for specific projects, selected according to its strategic plan

4.3.4

**EU funds**

Membership to EU calls as the FPs are performed by single

ASI Funding for Astrophysics Research (2005)	
Astrophysical domain	M €
High-Energy Astrophysics	18,039
Cosmology and Fundamental Physics	6,780
Solar System Exploration	10,439
Total	35,258

institutes and agencies or joint-ventures between them.

Structural Funds

The EU structural funds are partially administrated by the Italian government through the PON - *Programma Operativo Nazionale* (National Operational Programme), drawn up by the MUR to allocate the funds and plan the projects. The remaining part of the funds are administrated by local governments through the POR – *Piano Operativo Regionale* (Regional Operative Plan)

The PON envisions a quota of national co-financing and is intended for the Objective 1 Regions: Basilicata, Calabria, Campania, Puglia, Sardinia, Sicily as:

- contributions to the costs of research grants for research projects and activity, innovation and technological transfer involving companies;
- programmes to foster the mobility or temporary leave of the staff of universities and research bodies so that they can engage in research activity or technological transfer to companies

4.3.5***The regional funds***

Regional governments have a role in influencing research not only by administrating the complementary EU structural funds but, also by funding, with their own funds, programs that involve the research infrastructures present in their respective jurisdictions.

4.3.6***Private funds***

The Italian industrial system is made up, for the most part, of small and medium-sized businesses (SMEs) and these are responsible for about 70% of the production of goods and services. On the one hand, this is a factor that works for flexibility, but on the other, it does not allow for a sufficient 'critical mass' for large-scale research projects.

Research, in fact, is carried out, primarily, in a small number of large-scale industrial groups (such as ENI, FIAT, Pirelli, Telecom, ENEL, etc...) which have notable financial resources.

Unfortunately, in the astronomy domain, no sensitive funding cases from the private sector can be reported.

Companies & Astronomy

Astronomy and industrial sectors collaborate on technological projects by building telescopes, electronics, cameras and satellite instruments.

Current INAF policy is trying to improve the collaboration between industry and the astronomical technological spin-offs by the creation of a task force.

4.4 The Personnel

The professional profiles of people enrolled in astronomy research are common to other disciplines due to the similar nature of public bodies or universities.

Research staff positions in universities and research institutes are divided into three different levels: Full Professor/Research Manager, Associate Professor/First Researcher and Researcher.

Long-term (5 years) temporary positions may also be opened for the same three levels, and care has been given to special rules to attract Italian researchers from foreign institutions.

Postdoc positions may be opened by universities and research institutes with or without any direct link with specific projects, while other grants at the post or pre-doctoral level are typically associated with a specific project.

Ph.D. is awarded by universities, which select students with a competitive evaluation procedure. Universities fund also associated grants, without any pre-defined allocation to research projects. Public bodies can also fund supplementary grants for Ph.D. students, either, supplementing the number of grants without any pre-defined allocation to research projects or calling for an explicit link with specific projects.

The employment procedures are generally through public contests for permanent, non-permanent positions and fellowships, both, for scientific and technical-administrative staffs. The announcement for the contest must be published in the *Gazzetta Ufficiale della Repubblica Italiana* (Official State Bulletin) and, also, through nation-wide calls. The procedures to enter the contest are set forth by the law, and require a combination of written and oral examinations, in addition to the CV. The selection is made by an appropriate commission named by the authority (director) of the employing structure.

The stakeholders of targeted projects or directors of divisions can open temporary positions that support the activities of the permanent scientific or technical staff or that pursue a precise target or that fills a job vacancy, by using a form of contract called *Contratto a Progetto* (Project Targeted Contract) awarded after a comparative evaluation procedure of the candidates' curricula.

INAF Personnel (2005)			
Role	Male	Female	Total
<i>Dirigente di Ricerca / Dirigente Tecnologo</i> Research Manager/Technical Manager	63	9	72
<i>Primo Ricercatore / Primo Tecnologo</i> First Researcher/ First Technician	133	29	162
<i>Ricercatore / Tecnico</i> Researcher / Technician	246	88	334
<i>Others</i>	3	0	3
Total Permanent Staff	445	126	571
<i>Fellows</i>	209	107	316
Total	654	233	887

University Personnel (2005)			
Role	Male	Female	Total
<i>Professore Ordinario</i> Professor	58	2	60
<i>Professore Associato</i> Associate Professor	58	6	64
<i>Ricercatore</i> Researcher	48	13	61
Totale staff	164	21	185
<i>Non-Permanent</i>	87	45	132
Total	251	66	317