

## **ROA: 250 YEARS OF SCIENTIFIC ACTIVITIES**

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The origin of the Royal Naval Institute and Observatory in San Fernando, which is the oldest astronomical observatory in Spain, has its beginnings in the 18<sup>th</sup> Century. In 1751, Captain Jorge Juan of the Company of Midshipmen proposed to the Marquis de la Ensenada, the idea of building an observatory in the Castle of the Villa in Cádiz, which was the Headquarters of the Academy of Midshipmen. This was built with the intention of providing future Naval Officers with through Knowledge of Astronomy, the science that was so necessary for navigation.

From the date of 1753, the Royal Naval Observatory of Cadiz went on to earn deserved prestige in the context of European Astronomy thanks to the important development of work for personages such as Luis Godin or Vicente Tofiño and to the technical support of famous expeditions.

In 1798, the Royal Naval Observatory was transferred to the “Isla de León” in San Fernando, where it was constructed according to the plans of the Marquis of Ureña; this magnificent building has functioned until the present time. Starting in 1804, the organic dependency of the Academy of Midshipmen disappears and thus begins the scientific work of the institution into the new century, marked for well-known personages such as José Sánchez Cerquero or Cecilio Pujazón who worked in order to consolidate the function of the Observatory to its original astronomical work, added important missions to the Navy and to Spanish Science; such as the calculation of ephemeris and the publication of the Nautical Almanac, the Course of Superior Studies, the Warehouse of Chronometers and Instruments of the Navy and meteorological, seismic and magnetic observations. Nowadays the scientific activity is divided in four Departments:

- **DEPARTMENT OF EPHEMERIS:**

It is the mission of this Department to accomplish the theoretical studies and calculations of the astronomical ephemeris following the international rules of publishing in the most adequate form to their nautical and geodetic applications.

At present, the Department publishes annually the “Efermérides Astronómicas” to be used for astronomers, the “Nautical Almanac” in original and reduced version, both dedicated to the naval and air navigator and the “Astronomical Phenomena” including information concerning to eclipses, sunrise and sunset, etc.

- **DEPARTMENT OF ASTRONOMY:**

This Department develops their work within the field of the Astronomy of Position. Their fundamental mission is to determinate positions of celestial bodies and other magnitudes related to astronomy.

The Royal Naval Observatory participates with the Observatories of Greenwich and Copenhagen in the work of observation and investigation of the Danish Meridian Circle, whose installation on the Island of La Palma (Canary Islands) allows for the understanding of stellar catalogs of great extension and precision. The Department also uses a Meridian Circle Grubb-Parsons, the fundamental instrument of the Astronomy of Position, that, slightly modified and automated, studies the celestial sphere in coordination with the Meridian Circle of the Canary Island. The chosen place for their technical and environmental condition, is the Felix Aguilar Observatory of the University of San Juan (Argentina). Furthermore, the

Astrolabe Danjon directed to work observing of the Sun after conducting important modifications and the Gautier Astrograph incorporating a CDD camera to measure astrometric positions, has opened new possibilities of its utilization in the field of Astrometry and in the field of education.

- **DEPARTMENT OF TIME:**

The mission of this Department is to keep of time scales in use with the highest precision and accuracy, and to disseminate them in the most convenient way for the different scientific necessities such as navigation and national industry.

The installation is composed by an ensemble of ten Cesium Beam clocks, frequency and time primary standards, and two Rubidium, secondary frequency standards. With the readings of all of them, a Time Scale named Universal Time Coordinate with the Royal Naval Observatory, (Shortly UTC (ROA)), is generated and permanently contrasted through the Time Section of Bureau des Poids et Mesures (BIPM), being its differences with the Universal Time Coordinate periodically published.

The Royal Naval Observatory in San Fernando actively participates in the intercomparison of its time scale with other time laboratories in the world and it also collaborates in determining the International Atomic Time with the inclusion of all its clocks.

The Calibration Service is allocated inside this Department with the responsibility of checking time equipments to be used in the Navy. The Laboratory of this service is integrated in the national enterprise of calibration frame and it is able to issue certifications, as National Time Standard Laboratory, on the calibrations performed to the time and frequency standards of the secondary laboratories of the quality control chain in the Spanish industry.

- **DEPARTMENT OF GEOPHYSICS:**

Concern to this Department all the subjects related with geophysics and geodesy, developing the investigation in the fields of Geomagnetism, Seismology and Satellites. It includes the Geophysical Observatory of the Navy.

For the maintenance of cooperation initiated in 1891 with the International Association of Geomagnetism, the geomagnetic installation has been moved to the Barrio de Jarana in Puerto Real, in order to avoid environmental noise.

The study of seismology has been another of the traditional fields of this Department since 1898. The equipment available includes: a Short Period seismic net, with 9 stations located in different points of the South West of Andalusia; a three components Long Period Station, located into the tunnels of the Observatory and a Broad Band seismic network, with 5 stations deployed along the South of Spain and North of Africa Region.

The Department service related to Geodesy, is called the Satellite Service, and includes the specialized observation of artificial satellites, which the Observatory incorporates from its beginnings in 1958. The service is using a 3<sup>rd</sup> generation Laser Station, installed in the dome of the main building of the Observatory, and also is working a permanent tracking GPS network. The geodetic GPS equipments belonging to the service make feasible to collaborate with different institutions in national and international campaigns.

Also belonging to this Department, is the Meteorological Station of the Observatory which is collaborating in this field with the National Meteorological Net.

This Department is responsible also for the participation in Geophysics and Geodesy

campaigns, by own initiative or by invitation of other institutions. The participation in diverse Antarctic campaigns, surveys of Seismic Profiles, marine geomagnetic surveys, etc.

- **THE LIBRARY**

The library, inseparable from the scientific chore of the Observatory and of the educational tasks of the School of Superior Studies of the Navy, has at the present time, more than, 30,000 volumes. The specialization of their bibliographic and the important collection of periodic publications transforms it into one of the most interesting scientific libraries in Spain. The old bibliographic material of the library (15<sup>th</sup> to the 18<sup>th</sup> Century) is composed of works by a very special group for the history of science. In addition, the Library has an important collection of cartographic material (17<sup>th</sup> to 20<sup>th</sup> Century) and historic documentation about the institution from 1768 to 1940.

- **EDUCATIONAL ACTIVITY**

The School of Superior Studies in Science Mathematical Physics:

Founded in 1856, it has as its mission to give to groups of Officers of the Navy, a Physical/Mathematical Sciences Superior education which allows them, to form a faculty nucleus qualifying in Physical Sciences/Mathematics for the Higher School of learning of the Navy and in general positions, that require a special scientific preparation with a current knowledge of the evolution of the Sciences.

The Teaching is organized in two cycles: Basic and Specialization.

In order to complete the fundamental mission of the School, the Basic Cycle, with a duration of three years, is planned so that this course, increases the level so scientific preparation of Managers and Officials selected for a posterior specialization in the University and National or foreign Scientific Centres.

The Cycle of Specialization in Astronomy and Geophysics, with a duration of two years, is mainly dedicated to the preparation for the investigation and the education of the scientific personnel of the Royal Institute and Observatory of the Navy.