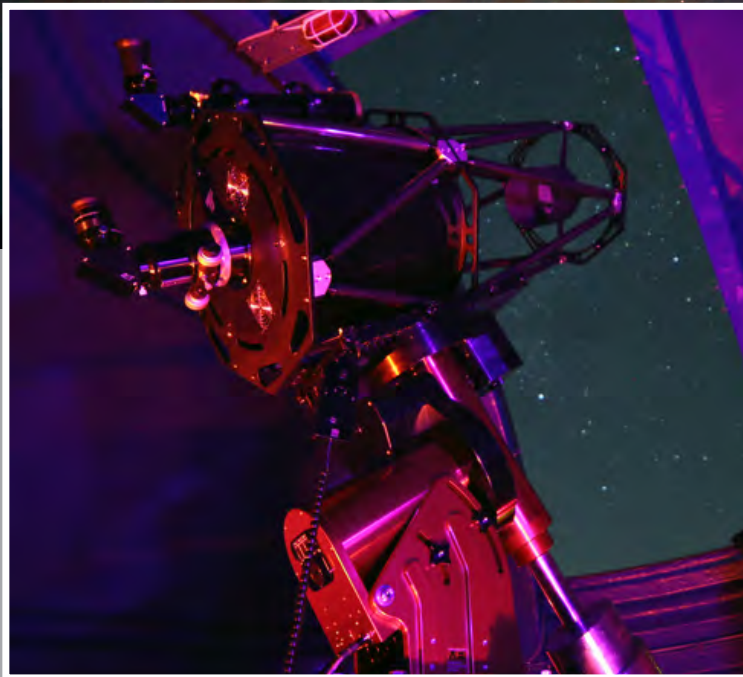


# ASTRONOMY FOR EVERYONE!





*Andromeda Galaxy*



*The Milky Way in Sagittarius and Scorpio*



ECS, S.L., is a service company which is specialised in Astronomy and Astrophysics.

Our company works with a wide repertoire of projects and activities in the field of astronomy, and we have more than 10 years' experience in this field. Our activities are sometimes quite diverse, but remain and complementary with each other because of our extensive work experience within the fields of industrial engineering and because of our continuous collaboration with professional astronomers.

We are open to fruitful discussions on a number of projects; including the design and construction of observatories and astronomy parks. We also offer services in the area of the management, maintenance, and commercial use of such assets.

Our many years' experience has allowed us to position ourselves in a rapidly emerging market which is the result of the fruitful progress and consolidation of the exciting field of AstroTourism. Our main objective is to assist our clients, so that they can develop their projects towards success. This includes providing professional advice and being exemplary actors within the field, as we demonstrate our commitment to Quality and Service.

Dr. Francisco Ángel Espartero Briceño  
Astrophysicist and Industrial Engineer  
Administrator ECS, S.L.



## THE DESIGN AND CONSTRUCTION OF ASTRONOMICAL OBSERVATORIES.

The design of an astronomical observatory, including a detailed study of the intended location (site-testing).



Image #1  
La Pedriza  
Astronomical Observatory



We can build an observatory, using the construction of a new building (images #1 and #2), or by renovating or extending an existing building (image #3).



Image #2



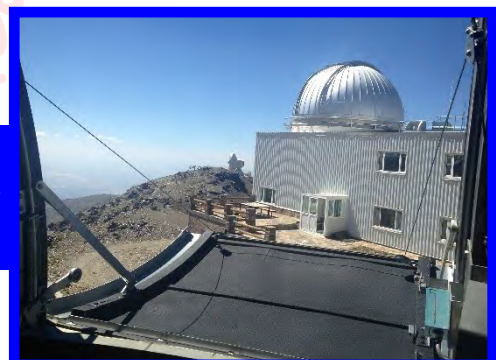
Universe Observation Center (COU)



The study and design of an astronomical observatory is unique to each project, which allows our clients specify their unique requirements and needs related to the observatory and its use.



Image #3  
Sierra Nevada Astronomical  
Observatory (OSN)



## ASTRONOMICAL OBSERVATORIES FOR TOURISM (ASTRO-TOURISM) AND AMATEUR USE.

The growing popularity of Astro-Tourism, in conjunction with the provision of facilities that are equipped with powerful telescopes, observation booths (either manual or automatic), and equipment to perform astrophotography (for example) will encourage tourists to visit our area. We can offer tourists exclusivity, the possibility of enjoying a night sky full of stars, whilst being located away from polluting light sources, in the middle of nature (*image # 4*).



Image # 4

*Astro-Tourism Astronomical Observatories*

For the amateur or non-professional, the demand on a correctly designed installation is important, so as to allow for the increasing demands the user puts on the installation as he or she becomes more expert and more curious of the wonderful world of the night sky (*image # 5*).

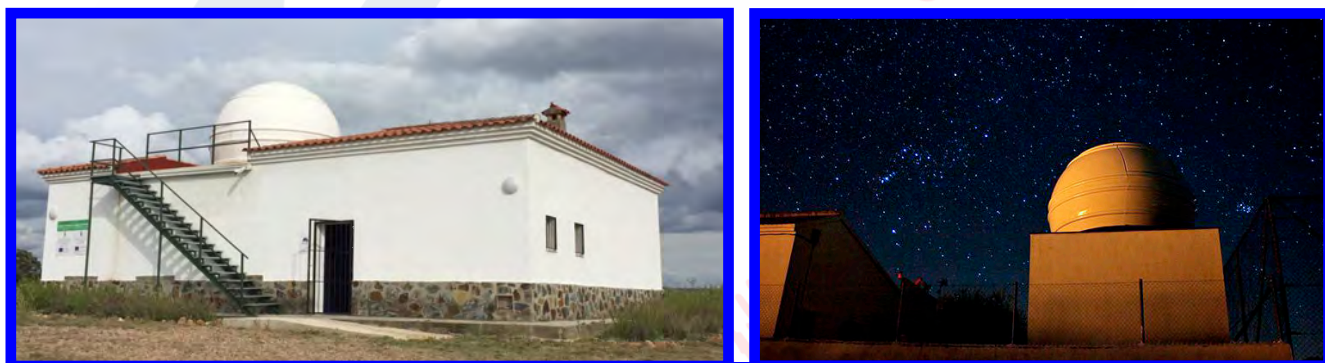


Image # 5

*Amateurs Astronomical Observatories*

ECS can provide all of the resources that are needed to integrate astronomical instruments and equipment in rural areas, whilst respecting the natural environment at all times. We provide facilities and appropriate means which will satisfy all of our even most demanding of clients.



## THE MANAGEMENT AND MAINTENANCE OF ASTRONOMICAL OBSERVATORIES.

Our field of operations is very broad. Central to our integrated solutions, we are able to partially- or fully manage observatories that have been designed for AstroTurismo, as well as providing maintenance services for the facility and for all of the installed equipment, including auxiliary equipment and astronomical instruments (*image # 6*).



Image # 6

*Management and Maintenance of Astronomical Observatories*



In summary, we are fully aware that an astronomical observatory is much more than merely a building with a telescope inside. Through our experience gained throughout over the years, we can assure that aspects such as location, accessibility, exterior spaces, equipment, and its maintenance, etc. are not ignored. We also note the importance of proper management of the astronomical observatory. All of these items are of vital importance for the long-term profitability of an astronomical centre as it strives to offer the best astronomical experience possible to its visitors and users.

## CENTRES OF ASTRONOMICAL INTERPRETATION.

We can provide "Interpretation Centres of the Universe" which include different and striking attractions which inform visitors about the beauty of our cosmos. Visitors can interactively engage with these attractions (*image # 7*).



Image # 7

Centres of Astronomical Interpretation

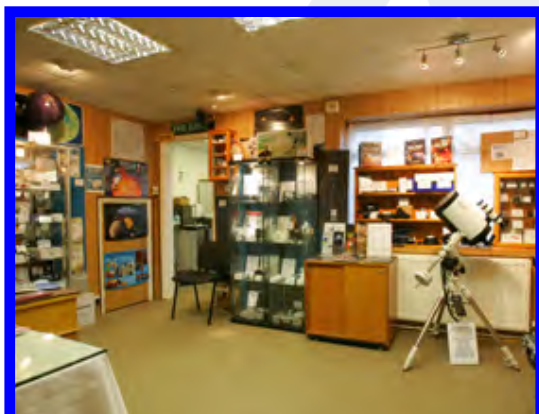


Image # 8

Merchandising

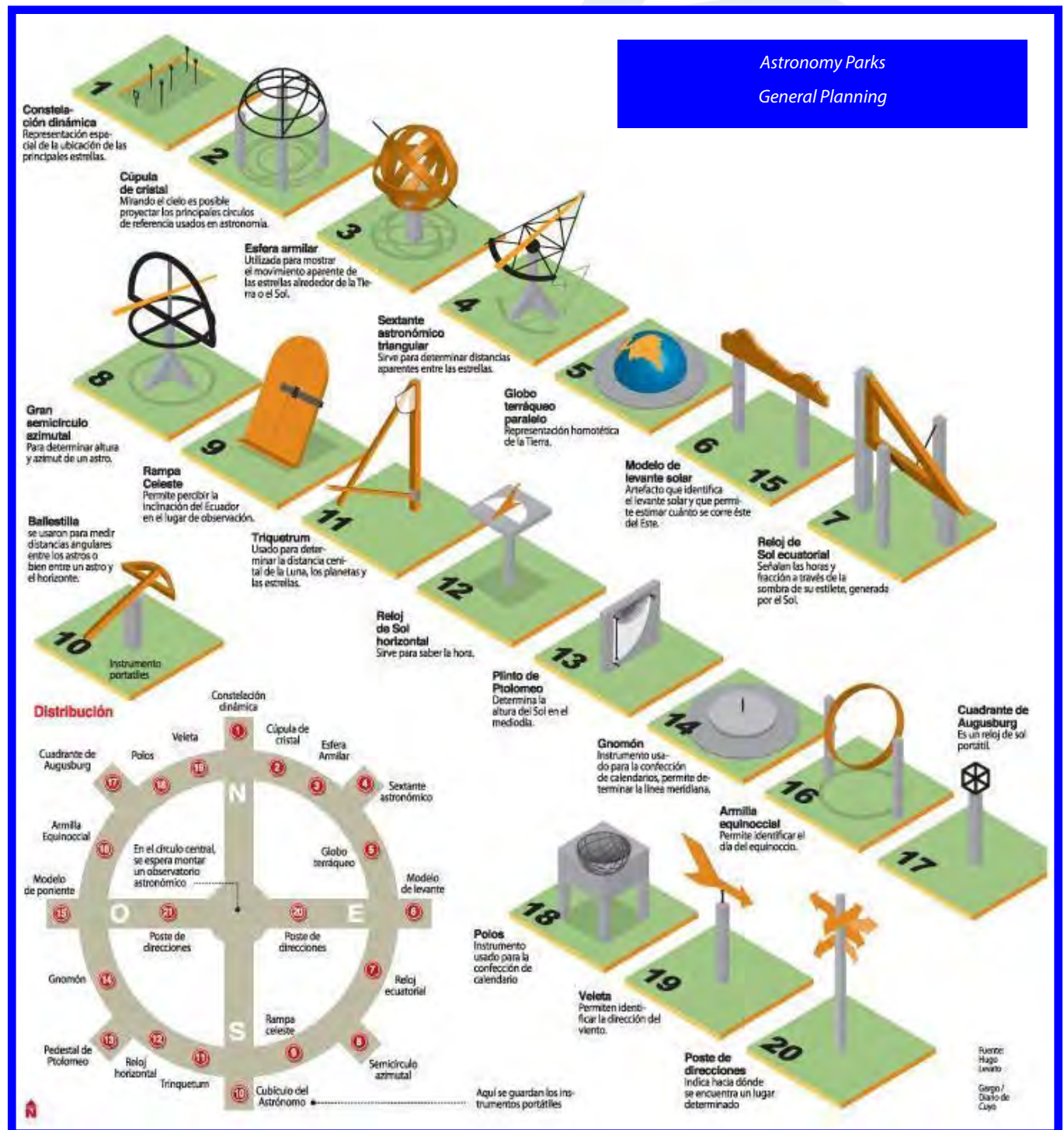
According to the client's needs, an interpretation centre can be the ideal complement to an observatory, or vice versa. Without a doubt, the public is especially keen on the opportunity of acquiring astronomical-related materials; including books, celestial planispheres, special glasses for solar eclipses, models of the solar system in miniature, sundials and so on. There is an almost endless range of astronomical products which are of particular interest to the public and do not go unnoticed by visitors to these centres (*image # 8*).



## ASTRONOMY PARKS.

An Astronomy Park includes a collection of astronomical observation instruments that have been used by astronomers throughout history. We include different celestial models that can be used to follow the relative movements of the Sun, the Earth, the Moon, and the stars.

Here we can see and touch models that illustrate the main concepts relevant to the celestial sphere, the equator and the meridians, and the ecliptic and celestial coordinates. Such experiences allows us to demonstrate various formative practices and activities that are related to the scientific field of astronomy.





## SOME MODELS THAT CAN BE FOUND IN AN ASTRONOMY PARK.

### An interactive sundial

This is a horizontal sundial, but its design is quite different to traditional sundials since it is the visitors themselves who constitute the gnomon (the part of a sundial that casts the shadow). The visitor's projected shadow will indicate the solar time.

### A "corrected" sundial

All sundials indicate solar time, to which we (in Spain) must add 1 hour in the winter and 2 hours in summer, so as to correspond to the "official" or civil time. An exception to this rule would be found with an equatorial sundial which directly indicates the official time on any day of the year (as long as a shadow can be cast).

### Calculation of the Earth's radius

This model illustrates a graphic experiment that shows how, in the year 240 BC., Eratosthenes calculated the Earth's radius to a very small margin of error. This was a remarkable achievement for the year in which it took place.



## SOME MODELS THAT CAN BE FOUND IN AN ASTRONOMY PARK.

### Celestial Sphere

A celestial sphere is a representation of the night sky that includes the constellations, the visible stars, and the position of the Sun in ten day increments. The sphere can be tilted so as to reveal what the sky looks like from different places on our planet. Ptolemy had an similar instrument, which he called an 'Astrolab'.

### The Sun's trajectory through the Sky

This model can be used to determine exactly the different heights over the horizon the Sun can reach at a particular location on the planet Earth. The height of the sun is at its maximum in the summer solstice, and is at its minimum in the winter solstice. The intermediate height corresponds to the trajectory that our star follows during the spring equinox and the autumn equinox, i.e. an identical height in both equinoxes.

### Astronomy Park

The panoramic view allows us see a clear image of the park's layout. Visitors to the park do not need to follow a fixed itinerary as they visit all of the models and experiments. Each model and experiment has its own information panel. The park is designed expressly with the intention to clarify astrophysical concepts via the use of the models and experiments, all of which support and complement each other in their didactic purpose.





## SUNDIALS.

The sundial or 'solar clock' is an instrument that has been in use since ancient times in order to measure the passage of time. Such devices have also been called 'solar quadrants'. We use the shadow that is cast by a gnomon (the part of the sundial that casts a shadow) on a surface which is marked off with a special scale to indicate the position of the Sun in its diurnal movement. According to the location of the gnomon and the form of the scale, sundials can measure different types of time; the most common being the apparent solar time.

There are different types of sundials, such as the Equatorial sundial, the Horizontal sundial, the Analemmatic sundial, and the Vertical sundial. The Declining sundial is a sundial which has a projection surface (which is the surface graduated with the hours) that is not perpendicular with the vertical plane that contains the axis formed by the poles. In this case, the solar quadrant is not exactly oriented towards the south.

Each sundial is designed and manufactured so as to be installed in a very specific place, and is rendered completely useless if we move it to another location.



## RURAL LOCATIONS, VIEWING-POINTS, AND PLACES OF SPECIAL INTEREST.

We can adapt rural houses, and even camping and recreation areas with fixed structures and/or mobile units that can accommodate the installation of telescopes, including a connection to the electric grid and the Internet.





## TRAINING COURSES FOR SUPERVISORS AND GUIDES IN ASTRO-TOURISM.

We provide courses in Astronomy and AstroTourism for the general public, schools, associations, and groups. We also provide for training programs for supervisors and guides who wish to work in the field of AstroTourism. All of our educational and training courses are given by qualified professionals in Astronomy, Astrophysics, and related sciences (image # 9).



Image # 9  
ECS monitors teaching during a course

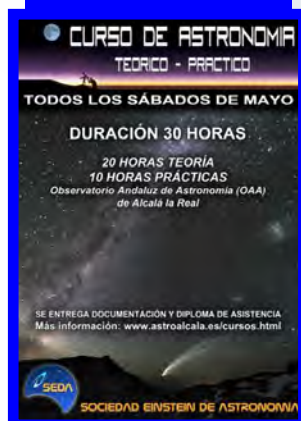


During the intermediate and advanced courses, training is provided with respect to the concepts of configuration, the setting up of and use of various types of telescope and telescope frames, as well as with respect to open-air practical classes concerning the solar system. The duration of the courses is 30 hours (basic), 50 hours (intermediate) and 100 hours (advanced or specific training course for supervisors and guides in Astro-Tourism).

Our company provides all of the necessary materials that are used during the courses; including an advanced robotic telescope and classic manual telescopes. We use an extensive set of other equipment, such as binoculars, laser pointers, eyepieces, filters, and other optical and technical materials, so as to guarantee a practical, entertaining, and didactic learning experience for every course participant.



Posters announcing courses of 100 hours and 30 hours



Astro-Tourism Cours



Training Classroom Andalusian Astronomical Observatory

## ASTRONOMY DAYS, STAR-PARTIES, CONFERENCES, WORKSHOPS, AND PUBLIC LECTURES.



Itinerant Astrophotography Exhibitions  
Informative Talks with Professionals and Amateurs  
Activities, Observations, and Exhibitions  
Educational Workshops for Children and Adults  
Night Observations Using a Natural Planetarium  
Solar and Lunar Observations





Trifid Nebula





**ECS, S.L., is an Engineering and Services company for Astronomy and Astrophysics.**

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