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## *Landscape drawing in engineering. The landscape collection of the Commission for the Geological Map of Spain (1850-1853)*

### I. INTRODUCTION

After the death of Ferdinand VII in 1833, Spain embarked on a process of important reforms leading to a constitutional monarchy. In this context of modernization, a detailed map of the country was needed, as all previous attempts at mapping had failed. However, it was not until 1849 that a Commission was formed to produce a geological map of the Madrid area and to collect and coordinate the data for the kingdom as a whole, an ambitious and innovative project for the time, and the only one of its kind in Europe (Rábano, 2015, 2017). To cover the programme of activities, four Sections were organized, with the geographical-meteorological section responsible for drawing the topographic maps, under the direction of José Subercase Jiménez, a civil engineer.

With the aim of establishing a geodesic triangulation network, the decision was made to draw panoramic views of the visible horizon to identify the points of interest observed and determine their relative position (Luján, 1852a). This was the start of a collection of landscape views for geodesic purposes, from which 130 drawings dating from 1850, 1851 and 1853 are conserved, and although these are of outstanding interest they have been largely ignored until now.

### II. LANDSCAPE AS THE SUBJECT OF ARTISTIC PAINTING AND TOPOGRAPHIC DRAWING

The new Renaissance concepts and the advances in perspective techniques led to the development of land-

scape painting. Of the various trends adopted, it is realist painting which is of most interest in engineering and science, as it provides useful information for land-based action or as a tool for communicating and disseminating knowledge. However, artistic quality is also essential for topographic and landscape drawing, as it makes the finished work stimulating and attractive to the viewer.

### III. LANDSCAPE DRAWING AS A TOOL FOR UNDERSTANDING THE TERRITORY

With the rediscovery of Ptolemy, visual images of the territory became part of the iconographic repertoire demanded by royalty and the ruling classes (Sazatornil, 2014; Llorens, 2007; Oliver, 2015; Cámara, 2009). This interest reached its peak during the reign of Philip II and became a model for other rulers. To ensure objectivity in the representations, some scientists perfected instruments for drawing.

By the 18<sup>th</sup> century drawing views related to civil engineering or military works had become very important and landscape drawings linked to the study of geological phenomena were also common (Portús, 2005). Landscape drawing was also increasingly used for the purposes of control and economic exploitation deployed by European powers, who promoted numerous political/military and scientific expeditions, which included artists and draughtsmen. The Enlightenment policies adopted by the Bourbons resulted in more than sixty Spanish expeditions between 1735 and 1800 (Martínez y de Pazzis,

2008). The most ambitious of these was the Malaspina Expedition (1789-1794), joined by the Spanish cartographer Felipe Bauzá, who drew a large number of coastlines and various series of landscape sketches, using a camera obscura for the first time on a scientific expedition, and also the Milanese artist Ferdinando Brambilla, who drew many detailed perspectives (Penhos, 2011). However, it was the Prussian naturalist Alexander von Humboldt who promoted the idea of art as an aid to science on a continental level and had an enormous influence on the pictorial representation of landscape and nature during the 19<sup>th</sup> century (Misch, 2008).

#### IV. THE INCLUSION OF LANDSCAPE DRAWING AS A SUBJECT IN ENGINEERING SCHOOLS

It was in France that landscape drawing was first included as a subject in the technical courses in two of the most important Schools of Engineering, the *École Royale des Ponts et Chaussées* (1747) and the *École Royale du Génie de Mézières* (1748), where the entrance exams included landscape drawing. This subject also figured in the curriculum of the *École Polytechnique*, created towards the end of 1794. After Bonaparte came into power, the *Ecole Impériale des Ingénieurs Géographes* was created in 1809, and landscape drawing and engraving were taught. In 1814 this became the *École d'application du Corps Royal des Ingénieurs-Géographes*, which continued to teach landscape drawing (Bret, 1989).

In Spain, the military sciences followed the French model (Muro, 1993). Thus, in the *Colegio General Militar*, which opened in Segovia in 1825, the young officers studied military drawing, which included views of the terrain or perspective sketches. The *Academia de Ingenieros* (1826) and the *Colegio de Artillería* (1829), also taught their students how to represent the terrain in plans and panoramic views. After the reorganization of the *Colegio General Militar* in Toledo in 1842, military drawing continued to be included in the curriculum, and in the special Schools for the Artillery and Engineers this was complemented with topographic and perspective drawing. The *Escuela de Estado Mayor* was also founded in Madrid with a curriculum which included topographic drawing. When it was decided in 1850 that each arm would take over the responsibility for training its own officers, the *Colegio de Infantería* was founded with a curriculum including geographic drawing and the *Colegio de Caballería*, which included military draw-

ing. All this justified that in 1853 the project for the geometric mapping of the *Carta Geométrica de España* was transferred to War Ministry, and a commission was formed with personnel from the General Staff, Artillery and Engineers.

In the civil context, during the popular rule of the Liberal Triennium (1820-1823) an *Escuela Politécnica* on the French model was proposed in Madrid, which was to teach topographic and landscape drawing, but with the absolutist restoration, this did not come into effect. Nevertheless, in 1826 the recently appointed Director General of Mines, Fausto de Elhuyar, re-established the *Academia de Minas de Almadén*, where Vicente Romero started to give public classes in geometric and landscape drawing.

After the death of the absolutist monarch, the *Escuela de Ingenieros de Caminos y Canales* for civil engineers re-opened in 1834 and the *Escuela de Ingenieros de Minas* for mining engineers opened the following year. To rationalize the preparatory courses for these degrees, the intention was to establish the *Colegio Científico*, where the curriculum included figure and landscape drawing, but the plan was later discarded. As a result, landscape drawing was incorporated into the teaching programme of the *Escuela de Caminos* in 1838, and the famous Romantic painter Jenaro Pérez de Villaamil was contracted to teach the course. The *Escuela de Ingenieros de Montes* for forestry engineers started work in 1848, with landscape drawing as one of the subjects taught. In the *Escuela de Minas*, on the other hand, this subject was not available, and in the end the planned *Escuela de Ingenieros Geógrafos* for geographers was not created.

After the study programme outlined in the 1845 *Plan General de Estudios*, the idea of creating a polytechnic school was revisited, and in 1848 the *Escuela Preparatoria* was set up to provide preparatory courses for the civil engineering, mining, and architecture schools. Pérez Villaamil was responsible for the teaching of landscape drawing, and this subject disappeared from the curriculum of the *Escuela de Caminos*. However, during the two-year period of the *Bienio Progresista* (1854-1856) the *Escuela de Caminos* recovered all its own subjects and shortly afterwards the *Escuela Preparatoria* closed down. As a result, in 1856 the *Escuela de Minas* added landscape drawing to its teaching programme. In this same year the Commission known as the *Comisión de Estadística General del Reino*, was created and took on the responsibility for producing a geographical map of Spain.

## V. JENARO PÉREZ VILLAAMIL, FIRST PROFESSOR OF LANDSCAPE DRAWING

Jenaro Pérez Villaamil y Duguet (1807-1854) was the person mainly responsible for the landscape training of the engineers who formed part of the geographic-meteorological section of the Commission for the Geological Map of Spain. Trained in the fine arts as a painter in the *Escuela Provincial de Bellas Artes de Cádiz*, Pérez Villaamil met the Scottish artist David Roberts in 1833, and adopted the Romantic landscape style, becoming its most important representative in Spain. He became a member of the *Real Academia de Bellas Artes de San Fernando* in 1835 and three years later joined the *Escuela de Caminos*. During this time he developed a prominent career as an artist, and in 1840 he was appointed court painter. With political links to the Regent Maria Cristina de Borbón, Villaamil moved to France after the accession of General Espartero to power and published there his opus magnum: *España Artística y Monumental*. In his absence, his place in the *Escuela de Caminos* was occupied by the engineer Alejandro Olavarría, until Villaamil returned in 1844. The following year he became Professor of Landscape, and rapidly acquired considerable prestige, not only in artistic circles, but also among civil and military experts. In 1846 he took charge of the teaching of landscape drawing in the new *Escuela Preparatoria*, where he taught until 1853, when he was diagnosed with cirrhosis and died shortly afterwards.

Exactly what he taught his students in the *Escuela de Caminos* and the *Escuela Preparatoria* is not known in detail, but we can suppose that he emphasised copying directly from life, as well as using numerous prints of work by various French artists and at least three albums by British artists as inspiration.

## VI. THE GEODESIC CAMPAIGNS OF THE COMMISSION FOR THE GEOLOGICAL MAP

Once the Commission was created, its members were nominated with Fermín Arteta as president and the civil engineer José Subercase responsible for the geographic-meteorological section and altitude measurements. Joaquín Ortega and Manuel Caravantes, also civil engineers, were proposed as supporting experts along with two draughtsmen. On 26 November Arteta was replaced by the member of parliament and military

Francisco Luján, who immediately put the Commission into action. Nevertheless, due to budget limitations, in the end only Ortega and the draughtsman Ramón Soto started work with the person in charge of the section, José Subercase. In addition, the first field campaign was reduced to only the three summer months. The work focused on starting the geodesic triangulation, operating initially from the Madrid Observatory and then with an itinerary on the perimeter of the province. From the start it was considered essential to draw panoramic views of the horizon, and 63 illustrations are conserved from this first campaign.

The following year Subercase was posted abroad, leaving Ortega in charge of the section. Two new assistants were nominated, the civil engineer Ángel Mayo and the technician Víctor Alderete. But as they were not able to join the project until the September of that year, operations were reduced to completing the triangulation and levelling of the sierra, with 60 drawings completed. On September 15 they received a consignment of instruments from prominent builders and a camera to produce panoramic daguerreotypes, probably the first of its kind in Spain, although they were unable to use it for the landscape views in that year.

The 1852 field campaign lasted longer, from March to November. But right at the start Mayo was sent to Burgos, so that the section had to concentrate on the measurement of a 5.5 km long geodesic baseline, on drawing some plans and on levelling, without any new landscape drawings.

Finally, in the fourth and last geodesic campaign, which ran from May to September 1853, with the additional assistance of Manuel Alderete, Vicente Carrasco and Juan Nicolau, four brigades were organized and distributed to work in the province of Madrid and the areas around Avila and Cáceres. Only seven drawings made during that year are conserved.

Towards the end of 1853 the decision was taken to transfer the steering committee for the *Carta Geográfica de España* to the War Ministry, and the Commission for the Geological Map was ordered to transfer all the materials related to geographical works to that Ministry. Nevertheless, Luján managed to ensure that the geographical section could continue its activities, although these were restricted to topographical tasks, and considered as auxiliary to geological, botanical, and zoological aspects. In 1854, however, the section did not take part in any field work campaign and there is no evidence that any landscape views were produced later, before it was finally disbanded at the end of 1859.

## VII. THE COLLECTION OF LANDSCAPE VIEWS PRODUCED BY THE COMMISSION FOR THE GEOLOGICAL MAP OF SPAIN

The collection of views conserved from the Commission for the Geological Map contains 130 illustrations, although not all of them correspond to landscape panoramas, as there are also some front elevations of buildings, several architectural or topographical plans, and 14 plans showing contour lines in areas varying widely in size. These are numbered following the chronological order of the three field campaigns, although with occasional errors, and not all the views the Commission produced are included. The majority are pencil or charcoal drawings, with some details retouched in pen and ink, where the originals were drawn in the field and later retouched at the desk.

The drawing paper varies widely in quality and format and is from three Spanish and two foreign paper mills. The different quality of the working styles is also evident, as the drawings are in various hands, although the authorship of each cannot be identified with any certainty. There is also a clear change of style between the drawings from the first year and those of the other years, showing how the landscape drawing adapted to the real aims of the section.

Some of the panoramic views from 1850 use a perspectograph grid, while others present a marked curvature of the line of the horizon, possibly due to the use of

a projection apparatus with a small focal lens. Most of the drawings in this first campaign represent the vegetation cover in some detail, possibly considering how this might be used by the members of the geological and botanical sections. In contrast, the drawings from the 1851 campaign are much simpler and are limited to providing greater identification of the visual angles measured, normally marking the points identified with a cross or dashed line. In the most extreme cases the drawing is reduced to a detailed drawing of the horizon line, taking advantage of the magnification range of their optical instruments. However, in three drawings the watersheds are retouched with grey watercolour brushstrokes. The meticulous detail and appearance of the views completed in 1853 would seem to suggest that they were drawn using as a model a daguerreotype produced with the camera acquired in 1851.

It is not known how the collection of views ended up in the private collection of the military engineer Francisco Coello, but we can suppose that after he was elected as a member of the *Comisión de Estadística* in 1858, he obtained the collection for his own cartographic project, considering that they were no longer needed for the geodesic work underway. Whatever the reason, his decision was providential, as it enabled the conservation of the only systematic collection of landscape views made in the 19<sup>th</sup> century by Spanish civil engineers, and which is of considerable interest in geographic, dasographic and even toponymic terms.