Art, neuroscience, and education. Santiago Ramón y Cajal's painting of the cerebellum

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ABSTRACT

Introduction. Sorolla's portrait of Cajal shows a painting of the cerebellum in the background. This study identifies and locates this painting, and comprehensively analyses its neurohistological content, underscoring its relevance for Cajal.

Material and methods. We analysed the original painting, located in the Department of Cell Biology and Histology of Universidad Complutense de Madrid (UCM), as well as images and institutional websites (Spanish Ministry of Culture, Universitat de València, Cajal Legacy). Documentary data about the Polygraphic Centre were provided by the UCM registry.

Results and discussion. The painting of the cerebellum, currently held at the school of medicine of the UCM, was drawn by Cajal and painted by Ramón Padró at the Polygraphic Centre of the school of medicine of the former Central University (which operated between the late 19th and early 20th centuries) for educational purposes. It depicts the cell components of the cerebellar cortex, which are thoroughly described in this study, and which became evident after the painting was restored. Furthermore, we compare this painting against a copy located in Valencia, and reflect on the reasons for the creation of multiple copies, linked to the foundation of the Polygraphic Centre. We also describe the discovery of a list of words written on the back of the canvas stretcher, establish the location of the copies, and identify images linked to Cajal where the painting can be seen. The recurrent presence of the Madrid copy of the painting of the cerebellum in images linked to Cajal, including Sorolla's portrait of him, suggests that it had a special meaning for him.

KEYWORDS

Cerebellar cortex, neurohistology, Ramón y Cajal, Padró, educational painting, Sorolla

Introduction

The discoveries of Santiago Ramón y Cajal (1852-1934) in the late 19th century revolutionised neuroscience. In 1888, the Golgi technique or *reazione nera* allowed Cajal to observe with great clarity the morphology of neurons and how their projections ended freely, rather than forming a continuous network, as had previously been believed.[1] This finding refuted the reticular theory proposed by Camillo Golgi (1843-1926), consolidating the neuron doctrine, which became the foundation of modern neuroscience. Based on this new perspective of the organisation of the nervous system, in 1891 Santiago Ramón y Cajal formulated the law of dynamic polarisation,[2] which establishes that nerve impulses travel from the dendrites and cell body to the axon, and are transmitted toward the next neuron. In 1906, Cajal was awarded the Nobel Prize in Physiology or Medicine, which he shared with the Italian histologist Camillo Golgi, despite their opposing views, "in recognition of their work on the structure of the nervous system."

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Although Cajal studied the entire nervous system, he focused on the neurohistology of the cerebellum, retina, cerebral cortex, and spinal cord, making excellent drawings and schematic representations of these organs. Given his interest in research and education, these drawings constituted an essential tool not only to defend his discoveries before the scientific community but also to support his histological explanations at university lectures.

In March 1906, before Cajal was awarded the Nobel Prize, his portrait was painted by the Valencian painter Joaquín Sorolla Bastida (1863-1923),[3] as noted in a letter that Sorolla sent to his friend and patron Pedro Gil Moreno (1892-1945).[4] The portrait was displayed for a few months at Galerie François Petit in Paris (in June of the same year) and, after being exhibited at different locations, ended up at the Museum of Zaragoza[4,5] in 2016. The portrait depicts a little-known, somewhat mysterious, painting in the background, to Cajal's right.

This study identifies said painting, discloses its location, and describes it thoroughly, comparing it against another copy. It also reviews the locations where the painting was exhibited and analyses its relevance in relation to different pictures of Cajal in which it can be seen.

Material and methods

Joaquín Sorolla's portrait of Cajal was consulted at CER.es, an online catalogue of the Spanish Ministry of Culture.[3]

The photographs of the painting of the cerebellum titled *Esquema de la estructura del cerebelo* (Schematic representation of the structure of the cerebellum), drawn by Cajal and painted by Padró, were taken by Paco Pimentel (Tras Imágenes); they belong to the historical collection of Universidad Complutense de Madrid (UCM) and can be consulted at the website of the university's Department of Cell Biology and Histology.[6]

The picture of the back of the canvas stretcher and the post-restoration pictures were taken with an Apple iPhone 7.

The picture of the copy held at Universitat de València was taken from the university's website.[7] Professor Adrià Besó and Amparo Mora, from the Department of Cultural Heritage of the Universitat de València, provided information about the condition and history of his painting.

To compare the copies located in Madrid and Valencia and identify differences, we superposed them using Microsoft PowerPoint.

The images of Cajal's drawings were provided by the Cajal Legacy, which belongs to the Cajal Institute (Spanish National Research Council, or CSIC for its Spanish initials), and is currently kept at the National Museum of Natural Sciences, in Madrid. Expanding the digitalised picture of Cajal's laboratory, also from the Cajal Legacy, helped us to identify most of the paintings hanging on the walls of the laboratory, which were nearly unrecognisable at first glance.

The UCM General Archive provided a copy of the issue of *Gaceta de Madrid* announcing the regulations for the creation of the Polygraphic Centre at the school of medicine of the Central University in 1894. It also provided documents on Ramón Padró y Pedret's resignation as a painter at the Polygraphic Centre.

The picture of Santiago Ramón y Cajal using a microtome, with the painting of the cerebellum in the background, was taken from the website of Casa Álvarez.[8] The picture of Francisco Tello using a microtome at the same bench as Cajal, and with the painting of the cerebellum in the background, was taken from an issue of *Revista Ibys*[9] published in 1959. The pictures of the graduation photographs were taken at the Official College of Physicians of Madrid, where they are displayed.

The data presented in this study were taken from the bibliographical sources listed in the references section.

Results and discussion

1) Sorolla's portrait of Cajal reveals another painting

On the portrait of Cajal painted by Joaquín Sorolla (Figure 1A), Santiago Ramón y Cajal is depicted wearing a dark suit and a black cloak, in a room with austere walls. In the background, to the right and behind a pile of books, a painting is hanging on the wall; the subject seems to be neurohistological, possibly a cerebellar folium (Figure 1B). Although this painting has aroused the curiosity of those who have described Sorolla's portrait, the description published by the Spanish Ministry of Culture[3] does not mention it. Some experts on Cajal's research[5,10] suggest that the painting is a microscopic view of a cerebellar folium, based on one of Cajal's drawings (Figure 1C) preserved at the Cajal Legacy and mentioned by Cajal himself in *Recollections of my life*.[2]

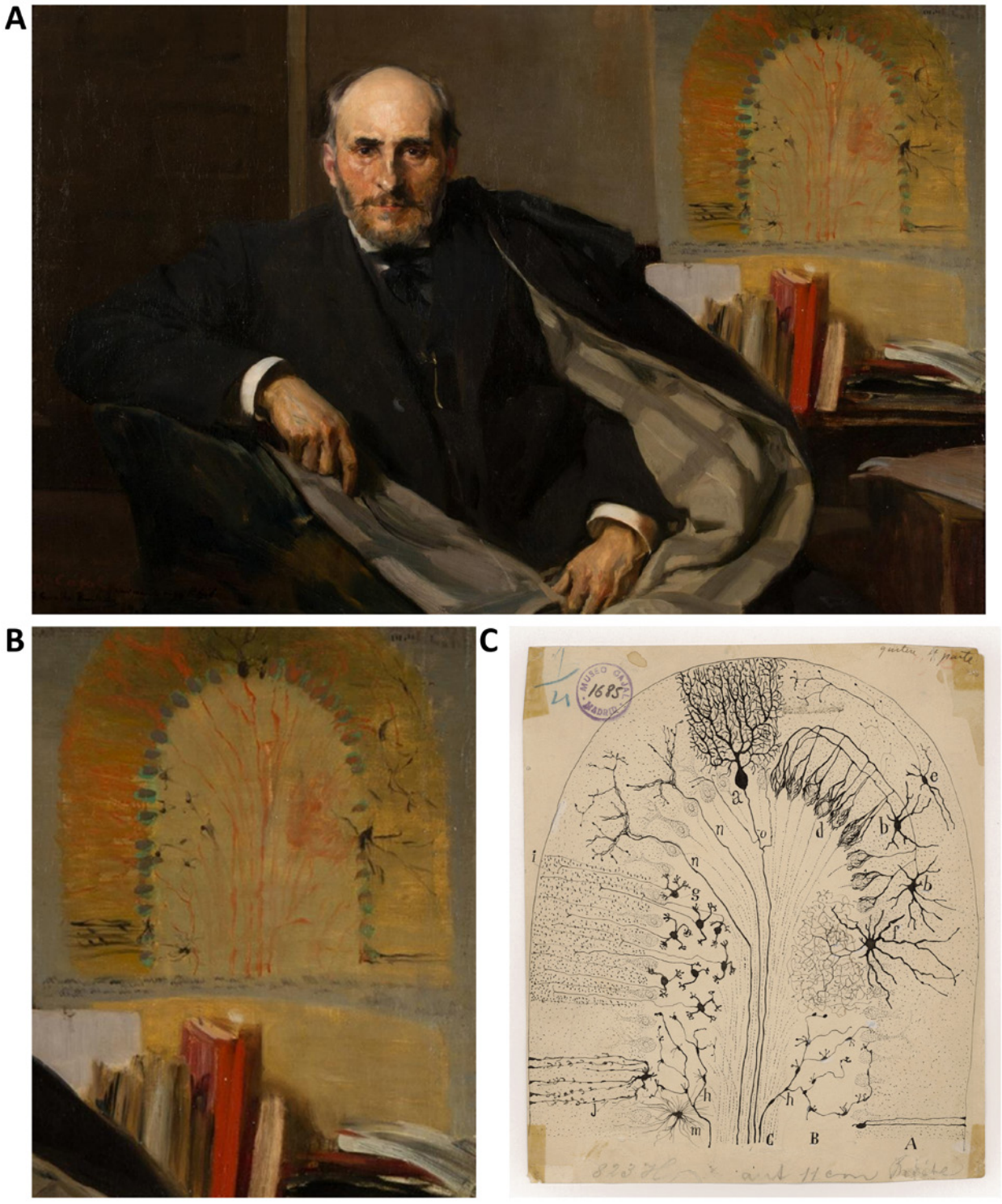


Figura 1. A) Portrait of Ramón y Cajal, by Joaquín Sorolla (1906). B) The painting *Schematic representation of the structure of the cerebellum*, drawn by Cajal and painted by Ramón Padró y Pedret, is seen in the background, to Cajal's right. C) Drawing of the transverse plane of a cerebellar folium made by Cajal; the drawing represents the most characteristic features of the cerebellar cortex and served as the basis for the painting shown in B. Sources: Spanish Ministry of Culture and Cajal Legacy (CSIC) (LC11322).

In his article "Santiago Ramón y Cajal's science and art," Gil de la Puente states that the painting was made by "R. Padró," clearly referring to Ramón Padró y Pedret (1848-1915).[10] However, none of them has been able to reveal which of the copies is represented in the portrait and where it is currently located.

We believe that the painting seen in the background of Sorolla's portrait of Cajal is a large oil painting (Figure 2A) made by Cajal y Padró, depicting the histological structure of the cerebellum. The painting, entitled *Schematic representation of the structure of the cerebellum*, is located at the Department of Cell Biology and Histology of the school of medicine of the UCM, and belongs to the historical collection of the university.

A comparison of the painting of the cerebellum shown in Sorolla's portrait against the actual painting *Schematic representation of the structure of the cerebellum* reveals a similar palette. Furthermore, Sorolla's structures perfectly match those seen in Cajal's painting. On the other hand, on the lowest part of the painting seen in Sorolla's portrait (Figure 1B), behind a pile of books, the brushwork is imprecise and diffuse, failing to render the details seen in Cajal's painting of the cerebellum (Figure 2A).

2) Cajal's preliminary drawings for *Schematic representation of the structure of the cerebellum*

Regarding the painting of the cerebellum seen in the background of Sorolla's portrait, Larriba[5] makes reference to a drawing of the cerebellum (Figure 1C) that, according to Cajal's memoirs,[2] is a schematic, yet highly detailed, representation of the components of the cerebellar cortex based on observations made with the Golgi method. The drawing was made in 1894 to support an outstanding lecture that he gave at the Academy of Medical Sciences in Barcelona. In describing the drawing, Cajal used the term "cerebellar gyrus," although the correct term would be "cerebellar folium" (gyri are found in the cerebral cortex). The lower part of the painting of the cerebellum depicts a longitudinal section of a cerebellar folium (Figure 2A), based on another of Cajal's drawings (Figure 2B), and corresponds to the area painted with imprecise strokes in Sorolla's portrait of Cajal (see lower part in Figure 1B, behind the books), which looks unfinished. Cajal included both drawings (Figures 1C and 2B) in his magnum opus *Textura del sistema nervioso del hombre y de los vertebrados*[11] (Texture of the nervous system of man and the vertebrates) and may be considered the precursor to Cajal's oil painting.

3) Description of *Schematic representation of the structure of the cerebellum*

The title of the painting analysed in the present study (Figure 2A) is written at the top of the canvas: *Esquema de la estructura del cerebelo*. It is an oil on canvas painting measuring 155 × 105 cm, and preserves its original frame. Two signatures are seen at the bottom: on the left, "S.R. Cajal delineó" (S.R. Cajal drafted), and on the right, "R. Padró pinx" (R. Padró painted). The painter was Ramón Padró y Pedret, mentioned previously, whom we will discuss in greater detail below. The exact completion date of the painting is unknown, but it is believed to be around the year 1900.

A dark circle measuring 13.5 cm in diameter is seen at the bottom right of the painting; this is the official seal of the Polygraphic Centre of the school of medicine of the Central University (currently, UCM), and displays Aesculapius in the centre, with his name in Greek and Spanish (ΑΣΚΛΕΠΙΟΣ - Esculapio) (Figure 2C). In Roman mythology, Aesculapius was the god of medicine and healing; his Greek counterpart was Asclepius.

This polychromatic painting was initially made for educational purposes. It depicts a cerebellar folium in two different planes: a transverse section in the upper part of the painting and a longitudinal section in the lower part; both planes are based on the drawings mentioned previously (Figures 1C and 2B, respectively). The cerebellar folia are the thin, elongated folds on the surface of the cerebellum; this tightly folded structure maximises the surface area of the cerebellum while maintaining a small volume. Notably, some structures of the cerebellar cortex are tightly organised along the longitudinal and transverse planes.

A caption at the top of the painting explains the abbreviations used for the structures of the transverse plane of the folium:

> Fig. 1: Schematic representation of the structure of the cerebellum. Transverse plane of a cerebellar folium. A. Molecular layer. B. Granule cell layer. C. White matter. a. Purkinje cell. b. Stellate cell of the molecular layer. d. Arborisation of Purkinje cells. e. Superficial stellate cells. G. The axis cylinder of granule cells bifurcates at the molecular layer. h.

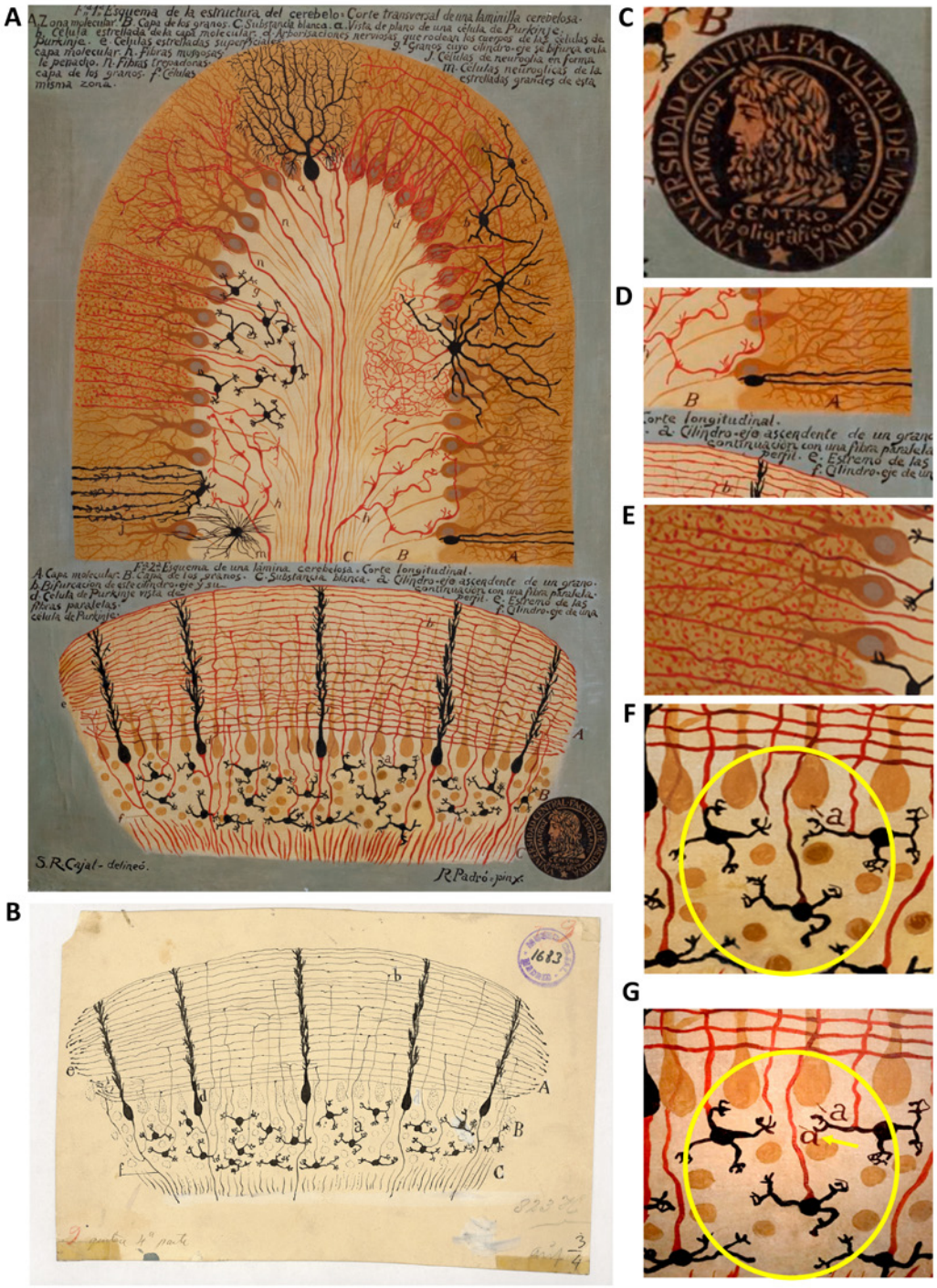


Figure 2. A) *Schematic representation of the structure of the cerebellum* (oil painting), drawn by Santiago Ramón y Cajal and painted by Ramón Padró y Pedret. B) Schematic representation of the longitudinal plane of a cerebellar folium, represented on the lower part of the painting of the cerebellar cortex (A). C) Seal of the Polygraphic Centre, which belonged to the school of medicine of the former Central University, on the bottom right corner of the painting, with Aesculapius depicted in the centre. D) Close-up detail of a cell, which Cajal does not label but which may correspond to a candelabrum cell. E) Close-up detail of the red dotted area, with each dot corresponding to the transverse section of a parallel fibre. F-G) Close-up detail of an error in labelling *a*: a short arrow points to the soma of a Purkinje cell (F), but should point to the axon of a granule cell, as indicated in the caption ("ascending axis cylinder of a granule cell"). A detail of the same area (G), following the restoration of the painting in May 2025, shows another *a* (yellow arrow), correctly indicating the axon of the granule cell, as indicated in the caption. Sources: Department of Cell Biology and Histology of Universidad Complutense de Madrid and Cajal Legacy (CSIC) (LC03122).

Mossy fibres. J. Tufted neuroglial cells. N. Climbing fibres. M. Neuroglial cells of the granule cell layer. F. Large stellate cells of the granule cell layer.

The cerebellar cortex is located at the periphery of the folium and contains neuron cell bodies. It is painted in ochre (a darker shade for the molecular layer [A] and a lighter shade for the granule cell layer [B]), the same colour that is observed under the microscope when samples are processed with the Golgi method (silver chromate). The central axis of the folium (painted in a lighter tone) contains the nerve fibres (white matter [C]) of the axons (a) of Purkinje cells (which emerge from the cortex), represented in the painting as ochre lines, except for the axon of the impregnated Purkinje cell, which is depicted in red. Mossy fibres (h) and climbing fibres (n) also appear in red (both carry nerve impulses from other locations of the central nervous system to the cerebellar cortex).

The painting is divided into sectors, each representing the morphology and organisation of specific cell components of the cerebellar cortex, as well as the distribution of axons and nerve fibres. Thus, Cajal provides a superb schematic representation of the complex structure and nerve connections of the cerebellar cortex. Under the microscope, a section of a cerebellar folium is far more complex, with overlapping of all the structures represented in different sections.

Among the many neurons drawn in the upper section of the painting, a frontal view of the body and highly branched dendritic tree of a Purkinje cell (a), painted in black, stands out. Purkinje cells constitute one of the most peculiar and distinctive types of neurons of the cerebellar cortex due to their flat, fan-like dendritic tree, which spreads out on the transverse plane of the folium. The cerebellar cortex also contains the cell bodies and dendrites of other Purkinje cells, painted in light brown, showing the arrangement of these non-impregnated cells. In the remaining neuron cell types, cell bodies and dendrites are painted in black, whereas the axon is painted in red.

The upper right area of the drawing shows the body and dendrites of a superficial stellate cell (e); the dendrites ramify at the most distal part of the molecular layer. The drawing also depicts stellate cells of the molecular layer (b), also known as basket cells. Their axons travel in parallel to Purkinje cell bodies, projecting axonal collaterals along their length that wrap around these cell bodies to form the so-called baskets. Basket cells deserve special attention because it is the neuron type that Cajal used to prove, in 1888, that neurons are separate cells,[12] a finding that served as the basis for the neuron doctrine. His studies on the retina,[13] published the same year, were also crucial in confirming this theory. Thus, the neuron doctrine replaced Golgi's reticular theory, which was the prevailing notion at the time.

The middle area of the top drawing shows large stellate cells (f), which are now known as Golgi cells. They present a highly ramified dendritic tree (in black) expanding mainly through the molecular layer, whereas the axon (in red) ramifies densely in the deep cortex (granule cell layer [B]), covering a large area.

The lower part of the top drawing shows mossy fibres (h), also painted in red, since they are axons; these fibres present small areas of irregular thickening along their length that correspond to rosettes, a structure described by Cajal that is not mentioned in the painting. What we found particularly interesting is the black cell (Figure 2D) at the bottom of the top drawing, which is not labelled. It is a cell with an oval body, located between Purkinje cell somas; it presents two straight projections that travel across the molecular layer, reaching the outer surface of the folium. Compared against other neurons described more recently in the cerebellar cortex, its morphological characteristics resemble those of candelabrum cells, discovered by Lainé and Axelrad in 1994.[14] Although this term describes the behaviour of their axon, Cajal's painting only shows part of its dendritic tree, which is similar to that of candelabrum cells.

Climbing fibres (n), represented in the upper left area of the drawing, are axons that travel to the cerebellar cortex from the white matter of other regions of the central nervous system. Each climbing fibre makes synaptic contact with a Purkinje cell, entwining around its dendritic tree like a vine. The behaviour of these fibres was key for Cajal's law of dynamic polarisation,[2] which states that neurons receive nerve impulses at their dendrites and cell bodies and transmit them through the axon. His studies on the retina were also pivotal in confirming this theory. In other paintings and drawings,[15] Cajal represents dynamic polarisation with arrows indicating the direction of the nerve impulse; this was not the case in *Schematic representation of the structure of the cerebellum*.

The middle left section of the drawing represents other functionally relevant components of the cerebellar

cortex, such as granule cells (g), which are small neurons whose short dendrites have claw-like endings. Their axons, painted in red, follow a straight course up to the molecular layer. In this region, an area of red dots can be seen between the axons of granule cells (Figure 2E). Each dot corresponds to the cross-section of a parallel fibre, represented as lines in the lower drawing of the painting, which displays a transverse plane of the folium.

The lower left area of the upper drawing also shows glial cells characteristic of the cerebellum, which Cajal called "tufted neuroglial cells" (j); these are known today as Bergmann glia. This area also presents neuroglial cells of the granule cell layer (m) and mossy fibres (h); the latter can also be seen in the lower right section of the drawing.

The bottom drawing in Cajal's painting represents a longitudinal section of the cerebellar folium reproduced in the upper drawing. It also has a caption explaining the abbreviations used to label each structure:

> Fig. 2: Schematic representation of a cerebellar folium. Longitudinal plane. A. Molecular layer. B. Granule cell layer. C. White matter. a. Ascending axis cylinder of a granule cell. b. Bifurcation of said axis cylinder and continuation with a parallel fibre. d. Lateral view of a Purkinje cell. e. Endings of parallel fibres. f. Axis cylinder of a Purkinje cell.

The bodies and dendrites of neurons are painted in black. The molecular layer (A) shows a lateral view of the dendritic trees of Purkinje cells (d) (it should be noted that these neurons are flat). The bodies and dendrites of granule cells are located in the deepest area of the cortex. The axons of these granule cells are painted in red (a); they ascend toward the molecular layer, where they bifurcate (b), giving rise to parallel fibres (these are the red dots described earlier in the drawing of the transverse plane of a folium; Figure 2E). These fibres travel through the folium, crossing the dendritic trees of Purkinje cells. Notably, there is an error in this drawing (Figure 2F): to the left of the label *a*, a short arrow points to the soma of a Purkinje cell, whereas it should be pointing to the axon of a granule cell located to the right of the label. Interestingly, the painting was restored in May 2025,[15] uncovering an additional *a* (Figure 2G) under a layer of paint, which correctly identified the axon of the granule cell. On the other hand, the axons of Purkinje cells (f) cross the granule cell layer, reaching the white matter (C); these are represented as vertical red lines at the lower part of the drawing.

4) The secrets hidden behind the canvas stretcher

A striking finding that makes this painting even more special is the presence of an organised list of words handwritten in pencil on the upper right corner of the canvas stretcher (Figure 3), as follows: "Vital / [crossed out] / Progeny / Lineage / Work / Ownership / Freedom / VE [crossed out] / Truth / Proportionality / Society / Fear / Conscience / Feeling / Fantasy / Idea / 1st 2nd 3rd Judgement." There is also a hand-drawn line that seems to indicate that the first word, "Vital," should be placed between "Fear" and "Conscience." Or rather, the line may be indicating that "Conscience" should be placed at the beginning of the list, right below "Vital," given that the upper end of the line appears to have an arrowhead. This suggests that the order of the words is not arbitrary. We do not know who wrote this list, its meaning, or its relationship with the painting. The mystery remains unsolved.

5) There are several copies of *Schematic representation of the structure of the cerebellum*

It is well known that Cajal and Padró painted several copies of the painting *Schematic representation of the structure of the cerebellum*. In addition to the copy described in the present study, located in Madrid, there is another copy in Valencia; the latter is probably better known as it has greater online visibility. It is held at Universitat de València as part of its medical and scientific collection.[7] Although they seem identical at first glance, detailed examination reveals over 20 differences (Figure 4A and B). A clear example is in the caption at the top of the painting: the letter "A" indicates "zona molecular" (molecular zone) in the Madrid copy (Figure 4) and "capa molecular" (molecular layer) in the Valencia copy (Figure 4B). As we shall see, some of these details enable us to distinguish between the Madrid and Valencia copies in photographs taken at the time.

The General Foundation of Universitat de València provided information about the journey of the Valencia copy. In a personal communication, Professor Adrià Besó (head of the Department of Cultural Heritage of the Universitat de València) and Amparo Mora very kindly provided us with this information in July 2023, which we reproduce literally below:

> The painting belongs to the former Museum of the History of Medicine, created in 1975 by Professor José María López Piñero at the school of medicine; in

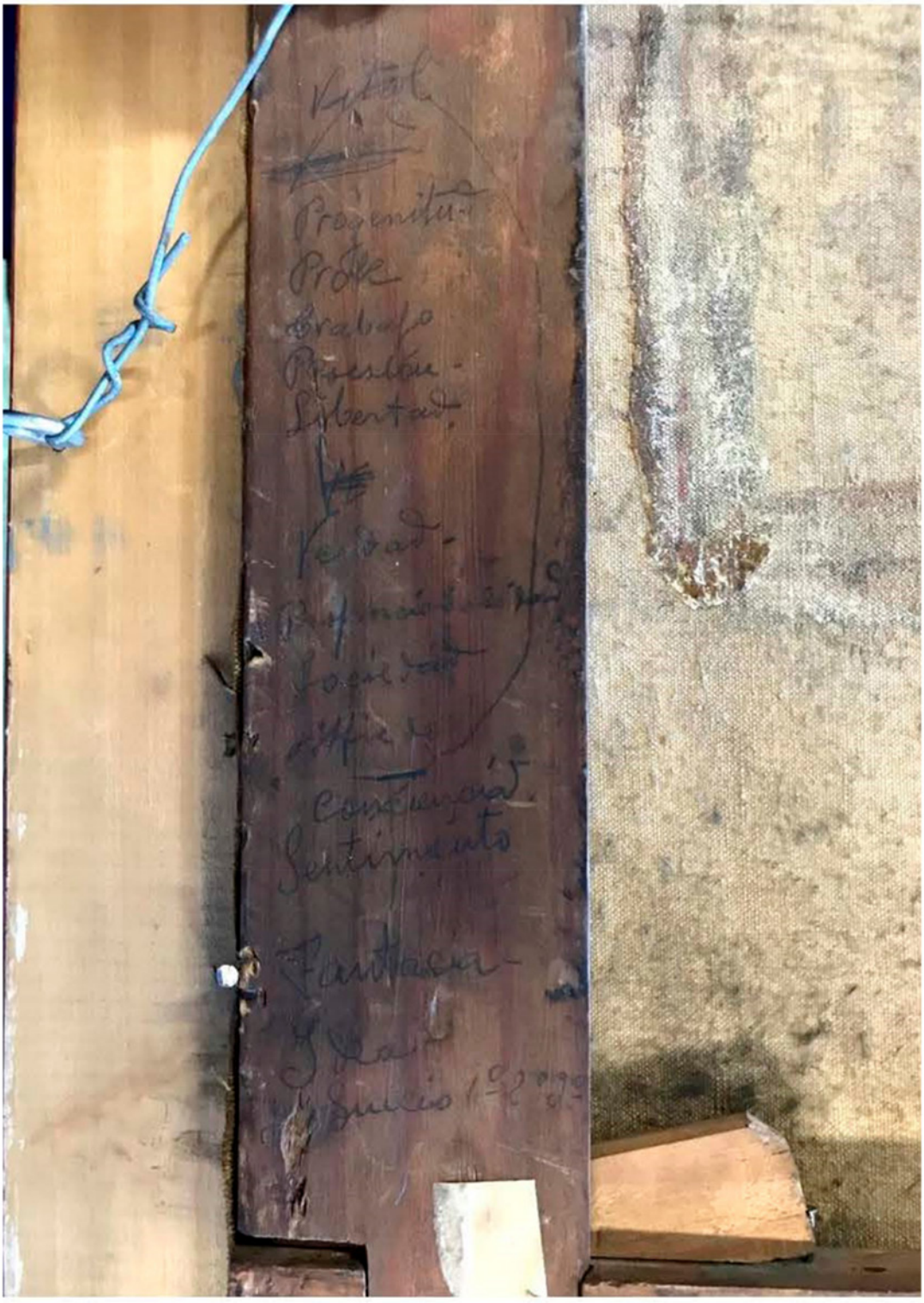


Figure 3. The right upper corner of the back of the canvas stretcher, with the following words handwritten in pencil: "Vital / [crossed out] / Progeny / Lineage / Work / Ownership / Freedom / VE [crossed out] / Truth / Proportionality / Society / Fear / Conscience / Feeling / Fantasy / Idea / 1st 2nd 3rd Judgement." Source: José Enrique García-Mauriño Múzquiz.

> 2006, the collections were moved to the old Cerveró Palace, which was restored for this purpose. In 2013, the painting was displayed as part of the permanent collection of the school of medicine: "The scientific collection of the Universitat de València. 2. Medicine and society." However, a few months later it was replaced with a photograph due to questions of conservation. The painting was restored that same year, but unfortunately we do not have the report. However, based on old pictures, it is obvious that the painting underwent relining and conservation picture framing. […] The last time that the painting was exhibited was last year, at the exhibition "La Nau dels Bojos: una odissea de la desraó" (The ship of fools: an odyssey through madness), at the La Nau Cultural Centre of Universitat de València from 12 May to 23 October 2022. Once the exhibition ended, the painting was housed in the stores of Cerveró Palace, until it was relocated a few months ago to the stores of the La Nau Cultural Centre, which has better conditions.

The question that arises is why multiple copies of the painting were created. Evidently, both paintings were made at the school of medicine of the Central University, since both bear the seal of the Polygraphic Centre at the bottom right corner. A search in the archives of the UCM retrieved the Royal Order of 25 February 1894 (Figure 5A), establishing the creation of the Polygraphic Centre of the school of medicine of the Central University. Said order was published in *Gaceta de Madrid* on 7 March 1894 and was signed by Segismundo Moret Prendergast (1833-1913), who at the time was president of the Board of Public Instruction. As indicated in point no. 1 (Figure 5B): "A drawing or painting studio or workshop shall be created in the building of the Anthropological Museum created by Dr Velasco; this studio will be established under the office of the Dean of the School of Medicine of Madrid and will be named Polygraphic Centre." Point no. 2 states: "The purpose of the Polygraphic Centre is to create a collection of canvases aimed at supporting the lectures of the university chairs of the eight schools of medicine of the Spanish mainland." Therefore, each painting created at the Polygraphic Centre had eight copies, one per medical school (in the late 19th century, the eight schools of medicine were those of Madrid, Barcelona, Valencia, Granada, Santiago de Compostela, Seville, Zaragoza, and Valladolid).[16] Regarding the painting of the cerebellum, only two copies are currently known: the copies held in Madrid and Valencia. The remaining copies, if they still exist, have never been found.

In our search for information about the Polygraphic Centre, the UCM registry provided a document about Ramón Padró y Pedret, the painter of *Schematic representation of the structure of the cerebellum*. He studied at the Llotja School of Arts in Barcelona. He was a court painter for Alfonso XII. Some of the most representative of his paintings include his portraits of king Alfonso XII and his wife, Maria Christina of Austria, as well as the paintings created for the main conference hall of the Royal College of Surgery of San Carlos in Madrid (1882-1884); the website of the Spanish Association of Painters and Sculptors provides further information about Padró.[17] According to the personal file on Ramón Padró (Figure 5C), he began working at the Polygraphic Centre of the Central University on 7 September 1896 and retired on 20 March 1915, just a few days before his death. It would be interesting to deepen our knowledge about the Polygraphic Centre, given the very little information currently available. We are particularly interested in knowing whether there existed a record of the paintings made at the centre, and their location.

6) Locations of *Schematic representation of the structure of the cerebellum*

The available information gives us an idea of the places where the Madrid copy was exhibited. One of our sources is a photograph of the histology laboratory (Figure 6A) of the school of medicine of the former Central University, located on Calle Atocha (the original photograph is held at the Cajal Legacy, currently located at the National Museum of Natural Sciences (CSIC), in Madrid. It was at the histology laboratory that Cajal and his collaborators gave practical classes to their students. Several paintings are seen hanging on the walls of the laboratory. Of the three paintings hanging on the right wall (Figure 6B), the one in the centre is *Schematic representation of the structure of the cerebellum*. Interestingly, the lower part of the painting is not resting against the wall, as the frame is warped, a feature that is still visible; the Valencia copy, in contrast, has lost its original frame. At present, the laboratory holds the library of the Official College of Physicians of Madrid.

Regarding the dating of the Madrid copy, and in relation with the photograph mentioned above, no documents were found that indicate the exact date when the painting of the cerebellum was made; therefore, secondary sources were needed. As a starting point, we used the photograph of the histology laboratory, which was displayed

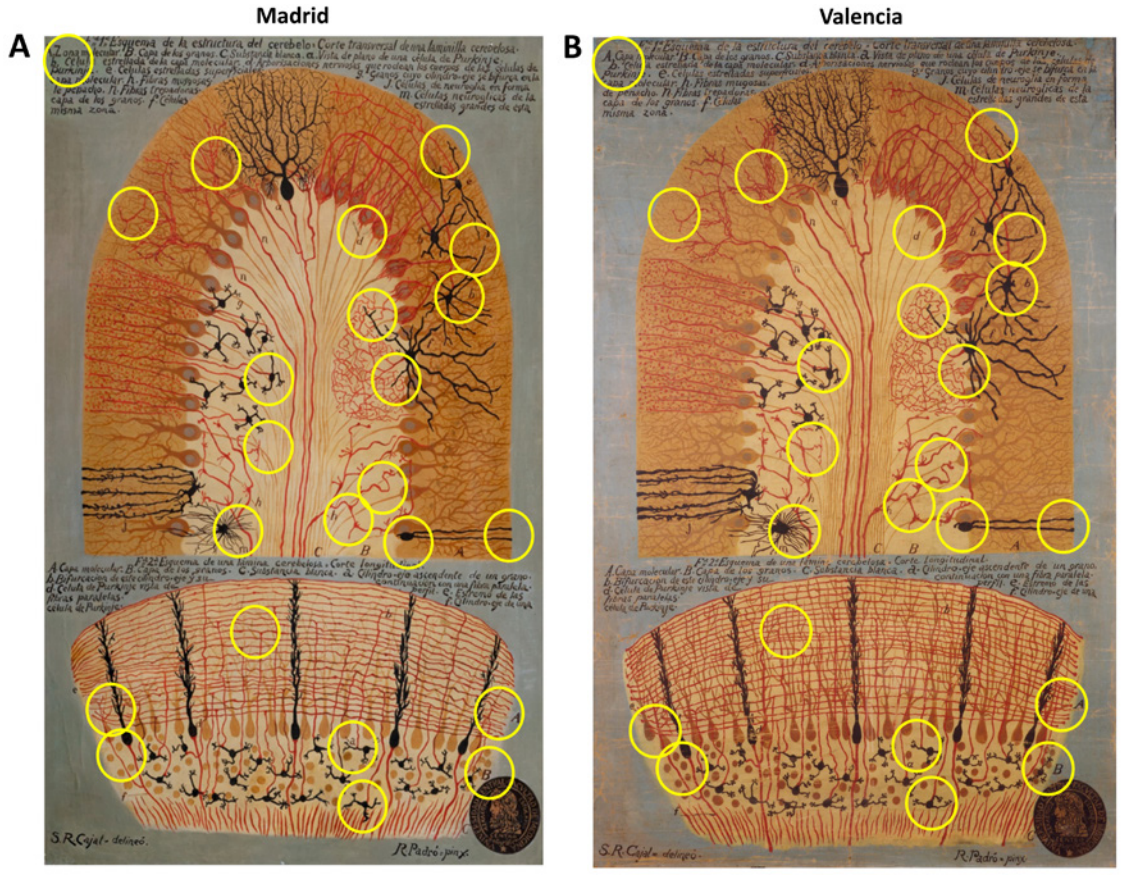


Figure 4. Paintings of the structure of the cerebellum drawn by Santiago Ramón y Cajal and painted by Ramón Padró y Pedret. A) Madrid copy (school of medicine, Universidad Complutense de Madrid). B) Valencia copy (medical and scientific collection, General Foundation of Universitat de València). The most significant differences are circled. Sources: Department of Cell Biology and Histology of Universidad Complutense de Madrid / General Foundation of Universitat de València.

at the exhibition "Santiago Ramón y Cajal (1852-2003): ciencia y arte," held in Madrid; in the exhibition catalogue,[18] the picture is dated in 1895. This is probably incorrect: the photograph must have been taken at a later date given that, in 1895, Cajal had been university chair in Madrid for three years, and the Polygraphic Centre was created in 1894. However, the most striking and contradictory fact is that Ramón Padró, who painted the six paintings displayed on the walls of the laboratory, began working at the Polygraphic Centre in 1896 (Figure 5C). In the light of these data, we may conclude that the painting was probably made around the year 1900, as is known to be the case with the Valencia copy.[7]

The painting of the cerebellum has been identified in other images related to Cajal. A little-known photograph (Figure 7A) shows Cajal sitting at his desk using a sliding microtome, surrounded by jars and laboratory tools. Interestingly, the painting of the cerebellum can be seen on the left (Figure 7B), and seems to be mounted on a stand, possibly to make it stand out from the background and appear in the photograph. We may wonder whether the painting observed in the picture corresponds to the Madrid or the Valencia copy. The dates suggest that it is the Madrid copy. To confirm this hypothesis, we must analyse two details shown in Figure 7B and C. This photograph and a nearly identical one were used in two

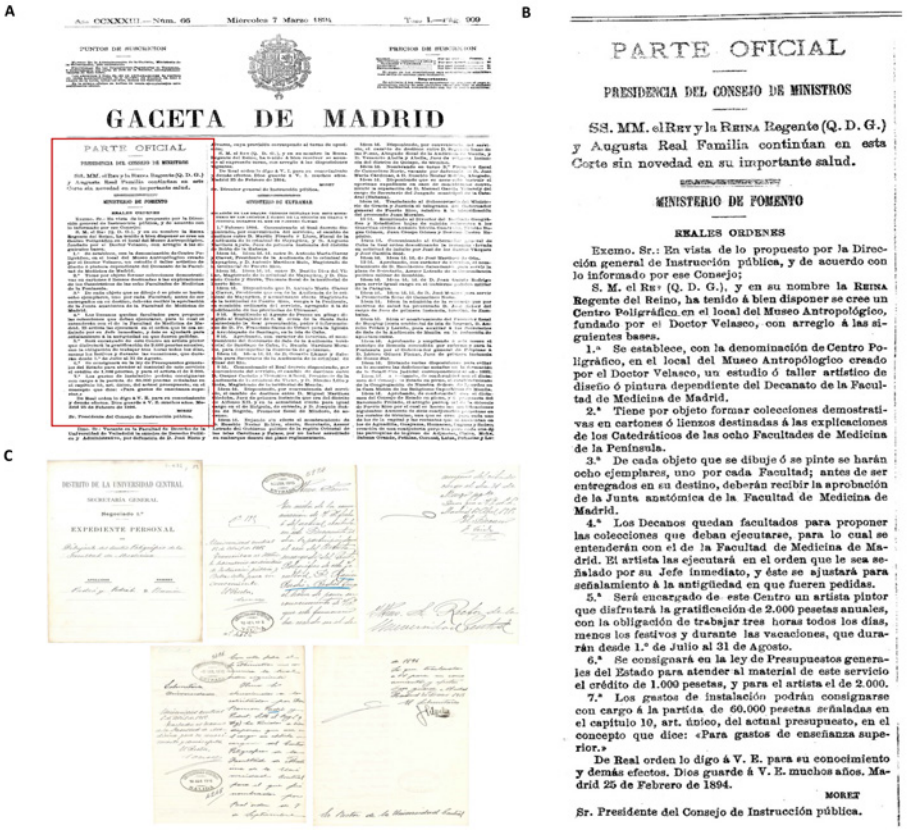


Figure 5. A-B) Issue of *Gaceta de Madrid* of 7 March 1894, publishing the Royal Order that established the creation of the Polygraphic Centre at the school of medicine of the Central University, signed by Segismundo Moret Prendergast (1833-1913), president of the Board of Public Instruction. C) Record of the retirement of Ramón Padró y Pedret as a painter at the Polygraphic Centre of the school of medicine of the Central University (currently, Universidad Complutense de Madrid) on 20 March 1915. Sources: *Gaceta de Madrid* and General Archive of Universidad Complutense de Madrid (AGUCM P-631, 24).

graduating class photographs from the school of medicine of the Central University for the years 1911 and 1924 (Figure 7D-G), with subtle changes in the arrangement of the objects on the desk. Another photograph shows Francisco Tello (1880-1958)[9] (Figure 7H), Cajal's closest disciple, using the same microtome, surrounded by the same laboratory tools arranged in the exact same position as in the picture of Cajal shown in Figure 7A, and with the painting of the cerebellum in the background. It seems that Cajal and Tello made a photograph shoot together.

The fact that Cajal chose to display the painting of the cerebellum both in Sorolla's portrait and in the photograph with the microtome (Figure 7A and G) seems not to be coincidental, and suggests that he had a special fondness for this painting.

In 1951, the school of medicine of the Central University began its progressive move from its premises on Calle Atocha to the Ciudad Universitaria campus[19]; as a result, the histology chair and the painting of the cerebellum were also transferred to the current Department of Cell Biology and Histology of the school of medicine of the UCM, becoming part of the university's historical collection.

In addition to this painting of the cerebellum, five other paintings are held at the Department of Cell Biology and Histology, all of which were drawn by Cajal and painted by Padró; they correspond to the paintings that



Figure 6. A) The histology laboratory of the school of medicine of the former Central University (currently, Universidad Complutense de Madrid). The paintings made by Cajal and Padró hang on its walls. B) Close-up detail showing the painting of the cerebellum (arrow). Source: Cajal Legacy (CSIC) (LC11397).

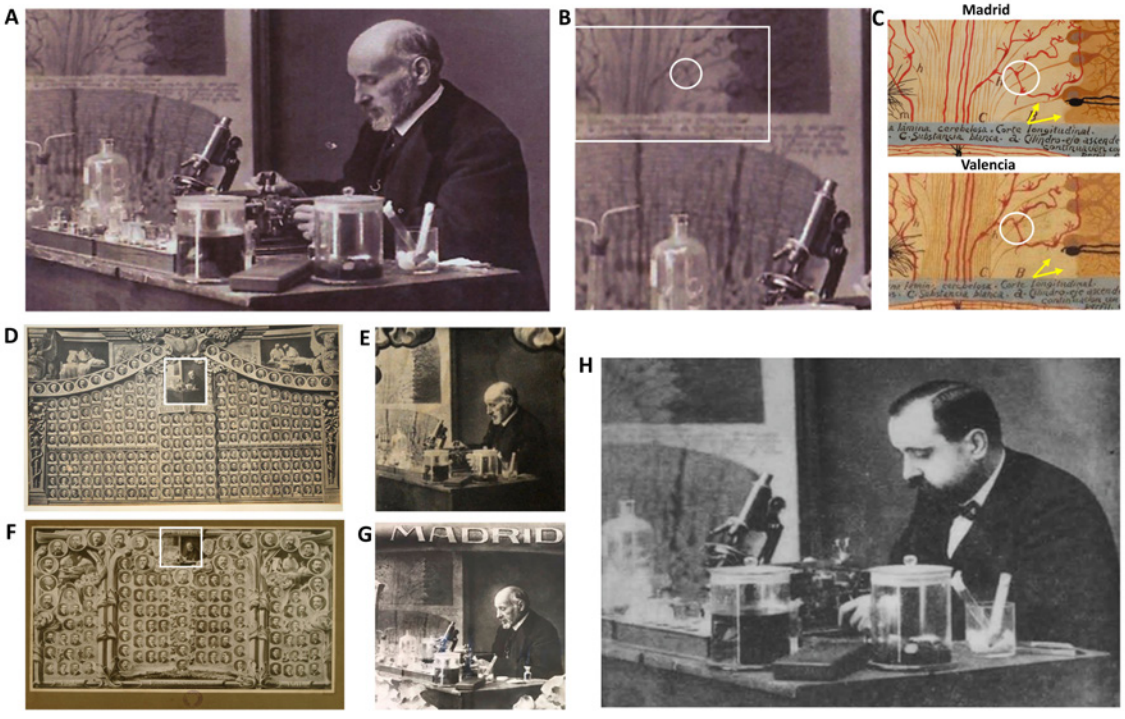


Figure 7. Photographs showing the painting of the cerebellum, currently held at the school of medicine of Universidad Complutense de Madrid (Department of Cell Biology and Histology). A) Photograph of Santiago Ramón y Cajal using a microtome (image taken from the website of Casa Álvarez), with the painting of the cerebellum in the background. B) Close-up of the painting. C) Differences between the Madrid and Valencia copies, which allow us to conclude that the painting displayed in the photograph is the Madrid copy. D-E) Medical school graduation photograph for the year 1924 and close-up detail of the picture of Cajal, showing a reproduction of the image shown in A, with the painting of the cerebellum in the background. F-G) Medical school graduation photograph for the year 1911 and close-up detail of a picture that is nearly identical to the one shown in A, except for minor differences in the tools placed on the table. H) Photograph of Francisco Tello, one of Cajal's closest collaborators, sitting in the same position and in the exact same setting as in picture A, with the painting of the cerebellum in the background. Sources: Casa Álvarez / José Enrique García-Mauriño Múzquiz and Official College of Physicians of Madrid / *Revista Ibys*.[9]

hang on the walls of the histology laboratory in the photograph mentioned above (Figure 6). The Factum Foundation was commissioned to restore these paintings by the Vice-Rectorate for Culture, Sport, and Associated Activities of the UCM in April 2025, on the initiative of Pedro Ramón y Cajal Agüeras, a great-grandnephew of Cajal.[15] They depict the following structures: retina; cerebral cortex; motor, sensory, and sympathetic vegetative connections of the spinal cord; neurons of the olfactory system; and organ of Corti in the cochlear duct of the inner ear (another copy of the latter painting is held at the school of medicine of Universidad de Zaragoza). The paintings, splendidly photographed by Paco Pimentel (Tras Imágenes), can be viewed at the website of the Department of Cell Biology and Histology of the UCM.[6] In the late 19th and early 20th centuries, paintings were frequently used to teach medicine, particularly anatomy[20]; however, few histology paintings are known. In his memoirs,[2] Cajal repeatedly mentions the use of large polychromatic illustrations in his conferences and lectures, to support the understanding of complex histological concepts. One example is in reference to his Nobel Prize acceptance lecture[2]:

> A few days later, the lectures by the recipients of the prizes took place. Upon the day set for mine, before a select and imposing audience I set forth the most fundamental results of my research work, adhering strictly to the facts and to the conclusions naturally suggested by them. According to my custom, in order to make myself clear even to the layman, I used a great many coloured plates of large size.[2,A]

In *Schematic representation of the structure of the cerebellum* and in the other paintings mentioned, Cajal very accurately reflected what he observed under the microscope. They all had a clear educational purpose, as is also suggested by the fact that they were exhibited at the histology laboratory (Figure 6A). Art, neuroscience, and education merge in a single piece of work, thereby promoting the dissemination of knowledge.

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