opusdei.org

Piedad de la Cierva: Science, Passion, and Vision

The historian Inmaculada Alva shares her insight into the life of Spanish scientist Piedad de la Cierva, a pioneer of the 20th century. Through her research, Alva highlights De la Cierva's remarkable contributions to science and her determination to forge a path in a predominantly male environment.

11/19/2024

Inmaculada Alva holds a doctorate in history and is a researcher at the Josemaría Escrivá Study Center (Centro de Estudios Josemaría Escrivá). She also teaches at the University of Navarre and is the author of several books on the history of Opus Dei. Her research interests include feminism, the visibility of women, and the development of Opus Dei among women between 1940 and 1950.

Starting 19 November 2024, the Central Library of the University of Navarre will host the exhibition "Piedad de la Cierva: Pioneer, Visionary, and Scientist." The exhibition is open to the public until 14 March 2025 and will provide an in-depth look into her life and scientific legacy. Learn more here.

Piedad de la Cierva was a 20th-century Spanish scientific pioneer who has received little attention in historical studies. I became interested in her career around 2016. Her personality and trajectory aligned with my research focus: highlighting remarkable women and rescuing their contributions from obscurity. I was surprised by the lack of references to her scientific achievements, despite her being a trailblazer in a predominantly male-dominated field.

Throughout her professional journey, she encountered men who recognized her abilities and supported her work. At other times, she faced prejudice from those opposed to women taking on such roles. Piedad de la Cierva's career was nothing short of extraordinary. She graduated in Chemical Sciences in 1932, received a doctoral fellowship from the Rockefeller

Institute in Madrid, worked as a researcher at the Spanish National Research Council (Consejo Superior de Investigaciones Científicas, or CSIC), and served as a civilian technician for the Spanish Navy. She excelled in every stage of her career, enhancing her expertise at research centers in Copenhagen, Paris, Berlin, and Washington. Among her notable scientific contributions were advancements in artificial radiation, the industrialization of optical glass in Spain, and refractory bricks made from rice husks.

Moreover, Piedad de la Cierva intrigued me because she was one of the first women to join Opus Dei as an associate, aligning with my research interests as a historian at the Josemaría Escrivá Study Center at the University of Navarre. Her connection to Opus Dei stemmed from a spiritual search that began in her youth.

Her early years

Piedad de la Cierva came from a family of notable figures. Her father, Juan de la Cierva López, was the nephew of politician Juan de la Cierva Peñafiel, who served as a minister several times during King Alfonso XIII's reign. Another uncle, Juan de la Cierva Codorniú, invented the gyroplane. Her mother, Serafina Viudes Guardiola, hailed from Alicante and was a devout woman who instilled religious devotion and Christian faith in her children.

Born in Murcia on 1 June 1913, Piedad was the eldest of four siblings, followed by her brothers Julián, Juan, and Francisco. She grew up in a cultured and intellectual environment. Her father, a lawyer, was a professor of Economics and Finance at the University of Murcia's Faculty of Law and also served as its secretary general. A demanding and

strict man, he foresaw the changing role of women in society and ensured that his daughter received an education that would allow her to pursue university studies after completing secondary school.

To this end, he hired two private tutors, one of whom ignited Piedad's passion for science. She fulfilled her father's expectations, completing secondary school in 1928 with top honors and receiving the Extraordinary Prize. A new phase in her life began, in which she could start to achieve the dreams she aspired to.

Although her father wanted her to study pharmacy, Piedad was determined to pursue chemistry. She completed her first year at the University of Murcia, where a preparatory course covering four basic subjects common to pharmacy, medicine, and science degrees was

offered. The following year, she continued her studies at the University of Valencia.

The move to Valencia marked a break from her stifling family environment and the monotony of her previous life. Everything was new, from the atmosphere — she was again the only woman in her class, with just four others in the entire faculty — to the courses and professors.

But these were turbulent times. During her first year in Valencia, strikes and demonstrations frequently disrupted university life. In May 1931, the proclamation of the Second Republic caused further unrest. Piedad had to leave the Escolapias residence where she was living and move to the home of Professor Ferrando, who had taught her in Murcia. Living with the Ferrando family introduced her to a

Christian family atmosphere marked by freedom and kindness, in stark contrast to her own home. Ferrando's wife, María Moliner, was another trailblazer in her own field, linguistics, and the author of the *Diccionario de uso del español*, a cornerstone of Spanish lexicography. Despite the challenging environment, Piedad completed her degree in 1932 at the age of 19, graduating with top honors and receiving the Extraordinary Prize for her Licentiate. This accomplishment marked the beginning of a new chapter. Encouraged by one of her chemistry professors, Antonio Ipiens, she pursued a doctorate in Madrid. Ipiens wrote a recommendation letter to Julio Palacios, a physics professor at the Complutense University and head of the X-Ray Section at the Rockefeller Institute, which had just opened that year.

In Madrid

When she arrived in Madrid, Professor Palacios welcomed her warmly and planned her studies. She would simultaneously complete her doctoral coursework at the Faculty of Sciences while working in the Institute's laboratory to learn X-ray techniques for her future doctoral thesis on crystalline structures.

The Institute of Physics and Chemistry, commonly known as the Rockefeller, had opened in February 1932. Piedad recalled being awestruck by its modern facilities, equipped with the latest technology. Her time there was immensely productive, as the intellectually vibrant atmosphere deepened her love for science. She also had the opportunity to meet renowned scientists of the time, such as Marie Curie and Albert Einstein, who visited to give lectures or collaborate.

The X-Ray Section, led by Julio Palacios, included three fellows and fourteen collaborators, among whom Piedad was one of the most outstanding contributors. Her work in the section resulted in significant and ongoing publications in prestigious journals.

In November 1935, she presented her doctoral thesis, titled “Chemical Factors of Sulfur and Lead,” earning the highest grade and the Extraordinary Doctorate Prize. Palacios encouraged her to apply for a scholarship to continue her studies abroad. She received funding to work at the prestigious Institute for Theoretical Physics in Copenhagen.

In May 1935, Piedad began her work at this research center, established by the Royal Danish Academy of Sciences for Nobel laureate Niels Bohr to develop his atomic research institute. The Institute became the

global hub for quantum physics, attracting brilliant researchers, many of whom later became Nobel laureates. Piedad worked under the guidance of Professor Georges von Hevesy, who would win the Nobel Prize in Chemistry in 1943. Von Hevesy taught her artificial atom disintegration techniques and guided her in her readings. Her research at the Institute led to several papers on artificial radiation, later published in esteemed Spanish journals.

Interrupted dreams

During her time in Denmark, Piedad de la Cierva exchanged knowledge with other pioneering women in her field. She shared a laboratory with Hilde Sevy, Hevesy's assistant. They were the only two women conducting research at the institute. In Paris, she was hosted by Irène Joliot-Curie at the Radium Institute, founded by her mother, Marie Curie.

In Berlin, Lise Meitner showed her the Kaiser Wilhelm Institute of Chemistry. All these women were brilliant scientists who contributed to the development of atomic physics, yet their achievements have not received the same recognition as their male counterparts.

De la Cierva had aspired to spearhead the development of radioactivity studies in Spain. However, the Spanish Civil War abruptly interrupted these ambitions.

After the war, she sought to resume her work on artificial radiation. Returning to Madrid in 1939, she found a drastically altered landscape. While Julio Palacios remained at the Rockefeller Institute, the X-Ray Section had not resumed operations, and no university projects were planned for the coming academic year.

She soon found an opportunity to explore new areas of research. In October 1939, physicist and naval officer José María Otero Navascués offered her a position in his project to create an optics section aimed at advancing the research and production of optical instruments for the Spanish Navy. This marked the beginning of her involvement in the initiative that would later become the foundation for the Institute of Optics. Her collaboration with Otero Navascués immersed her in Francoist Spain's industrial and technological policies.

For Otero, Piedad de la Cierva represented the ideal scientist: a professional researcher with social, economic, and legal recognition who was committed to applied science. Also, her prestige, coupled with her family connections, protected her from the political purges that affected prominent scientists from

the Second Republic, such as Moles and Catalán.

In May 1940, the optics section was integrated into the Spanish National Research Council (CSIC). Otero was appointed as its head, and Piedad continued as a research fellow. By 1946, the section had evolved into the Daza de Valdés Institute of Optics, with Otero as director and Piedad as a contracted researcher. She was the first woman to be officially employed by the CSIC. She remained there until 1949.

In 1941, she applied for professorship positions in Physical Chemistry at the universities of Madrid, Murcia, and Seville. The positions in Madrid and Seville were awarded to male competitors, while the Murcia position remained vacant. Suspecting that she had been passed over because she was a woman, she decided to leave

academia and focus solely on research, which she found more fulfilling.

At the Daza de Valdés Institute, her work involved preparing aluminum-coated mirrors necessary for manufacturing optical instruments. This task was particularly challenging, as there was little existing literature and the techniques had only been developed in Germany. After seventeen months of intense work, she succeeded in creating anti-reflective coatings for glass surfaces. In 1946, she presented a report on her work to the Academy of Sciences, earning the institution's First Prize for Research. She was the first woman to receive that honor.

In 1945, the creation of the Research and Workshop Laboratory for the Spanish Navy's General Staff (LTIEMA) marked a turning point in her career. As director of the new

center, Otero Navascués ensured Piedad was hired to work on the industrialization of optical glass, a key material for manufacturing optical instruments such as cameras, microscopes, and cinema projectors.

At the time, optical glass production was limited to a few European companies in Germany, France, and England. After 1914, the United States began producing its own, followed later by Italy, Russia, and Japan. In 1945, Spain joined this exclusive group.

Otero proposed sending Piedad to the United States to learn advanced glass production techniques. Arrangements were made with the National Bureau of Standards (NBS) in Washington, and the Navy funded her trip with a scholarship. This was a new opportunity to lead pioneering work in Spain. Her stay in the US from 1948 to 1949 was

transformative. At the NBS, she rotated through departments specializing in raw material analysis, physical property studies, crucible manufacturing, and glass production.

From Washington, she also visited institutions like the University of Toledo's Faculty of Glass Engineering in Ohio, Libby Owens (experts in unbreakable glass, unknown in Spain at the time), and Kodak in New York. Before returning to Spain, she outlined the personnel and equipment needed for a future factory and purchased materials and glass samples to use as models.

Upon her return to Madrid, she assembled a team comprising four chemists, a laboratory assistant, and five workers. They constructed the first test furnace and began producing glass, initially in small pieces and eventually in "large, clear,

diamond-like blocks of glass," as Piedad described in her memoirs.

In 1954, she presented her findings in a report titled "Experiments in Optical Glass Production" at a CSIC competition. The following year, her team received the prestigious Juan de la Cierva First Prize for Technical Research, and the report was published by the CSIC.

Piedad de la Cierva's groundbreaking contributions laid the foundation for Spain's optical glass industry, cementing her legacy as a trailblazer in applied science and technology.

Spiritual searching

Despite her professional successes, Piedad de la Cierva felt that something was missing. She wrote in her memoirs: "I had placed myself confidently in God's hands, and my professional life, filled with engaging and enjoyable work, unfolded

smoothly. I had a certain prestige, good friends who made my work life pleasant; I went to theaters, cinemas, and concerts. But something was missing."

She was a woman of deep convictions, combining her scientific passion with a desire to follow God's will. Her scientific discoveries often brought her back to God, as she noted on one occasion: "I was amazed to think that God, the Creator of the universe, had arranged the tiny atoms in such an astonishing way."

At various points, she wondered if God wanted something more from her; perhaps to join a religious congregation, as was common at the time for women who wished to dedicate themselves to God. However, she felt that such a calling should align with the path God had opened for her in the scientific

world. As she explained, "I had to dedicate myself entirely to God, but in a way for which my previous life (my studies, work, and travels) had prepared me. Everything was meant to serve God's purpose."

Her encounter with Opus Dei answered this spiritual quest. In 1945, she first came across *The Way*, a spiritual book by Josemaría Escrivá de Balaguer, given to her by her sister-in-law. Reflecting on her reading, she wrote: "Reading *The Way* made a great impression on me. I realized that the work I enjoyed so much could make me a saint. I understood that, without anyone telling me about it, I had also been praying as I studied. And I saw that the small painting of The Agony in the Garden by Salzillo, which I had hung opposite my desk at the Navy, helped me lift my eyes to the Lord when they were tired from the microscope."

In May 1952, she was introduced to Zurbarán University Residence, where she met other women from Opus Dei. Gloria Toranzo, the director of the residence, explained the core message and the radical nature of the calling. After months of exploring and living the spirit of Opus Dei, Piedad asked for admission during Christmas of 1952, becoming one of the first associates. From that moment on, she balanced her scientific career with her dedication to Opus Dei, helping spread its message of sanctity in everyday life.

After the New Year, she attended her first circle at the Zurbarán Residence with other associates, like Conchita Sandino and Josefina Escós, who she was meeting for the first time. She soon began taking care of the formation and guidance of supernumeraries. Cruz Tabernero, who coordinated this work of formation, entrusted her with a

group of supernumeraries and gave her some advice. Piedad felt a deep sense of responsibility, knowing she was called to help each person discern what God wanted for her. She carried out this task for the next forty years of her life.

Her professional opportunities continued alongside her responsibilities as a woman of Opus Dei.

New paths

In November 1955, José María Otero Navascués left the LTIEMA to work for the Nuclear Energy Board. Under its new leadership, the optical glass project was abandoned in early 1957.

Piedad sought new research avenues, including polished glass surfaces, which led her to present a paper at a prestigious glass conference in Paris. During her trip, she visited Rome to meet the founder of Opus Dei. During

their conversation, St. Josemaría expressed interest in her research and mentioned that he kept the optical glass she had sent him in a display case. Piedad shared her concerns about helping supernumeraries well, and St. Josemaría reassured her: "It is not you who leads them; it is the Holy Spirit," he said.

In October 1961, Piedad organized the first spiritual retreat for women in Murcia. She asked for five days off of work and traveled to the city by train. The retreat, which took place from 24 to 27 October with 13 attendees, was a memorable experience. In the first talk she gave them, she notes in her memoirs, "I told them that they were part of the history of the Work." She returned to Murcia several times for monthly recollections and talks for a group of women in a friend's house. The first

supernumeraries in the region came from that group.

At work, she continued exploring new research topics, including the insulating capacity of rice husks. Inspired by an American journal article about insulating bricks made from rice straw ash, she recalled childhood memories of ice blocks transported in rice straw. She began experimenting independently, creating refractory insulating bricks applicable to ship boilers and cement kilns. Her work earned her the Juan de la Cierva Technical Research Award in 1966.

Throughout her career, she mentored young scientists, directing their doctoral theses even though she could not officially be listed as their supervisor due to her lack of a professorship. One of her mentees was Guadalupe Ortiz de Landázuri.

Final years

As LTIEMA shifted focus, Piedad lost interest in her research and found her work increasingly routine. The loss of a brother in 1969, the worsening health of her mother, and the lack of research opportunities led her to an early retirement at the age of 63. She retired on 1 March 1976, after a distinguished scientific career.

On the very day of her retirement, she traveled to Murcia to lead a spiritual retreat for women. Upon her return, she began a new chapter: caring for her mother and dedicating more time to the St. Gabriel work. Her later years were marked by challenges, including a detached retina, the deaths of another brother and a nephew, and eventually her mother's passing in 1991 at the age of 100.

By 1992, her progressive blindness forced her to relinquish her duties,

but she began writing her memoirs. Piedad de la Cierva passed away in 2007 at the age of 93, her cognitive abilities greatly diminished.

Piedad de la Cierva's contributions to Spanish science are undeniable. Her career spanned two distinct historical periods — the Second Republic and Franco's regime — demonstrating remarkable continuity in her pioneering work. She was a courageous woman whose passion for science led her down paths rarely traveled by women of her time.

Her memoirs open with a reflection that aptly summarizes her extraordinary life: "I just turned eighty, and I am still amazed. I have come this far gently, almost without realizing it, leaving behind a long past that I will remember as sometimes difficult, but always full of meaning, work, joy, and peace."