Triumph over Prejudice: The Election of Radiochemist Marguerite Perey (1909–1975) to the French Académie des Sciences

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Abstract: The election of French radiochemist Marguerite Perey (1901–1975), discoverer of the heavy alkali metal francium (Atomic No. 87), the last discovered naturally radioactive element, to the Académie des Sciences in 1962, helped to overcome the traditional prejudice against women. The circumstances of her election, the reaction of the popular media to the event, including incorrect newspaper and magazine accounts of her life and achievements, and consequences of her election are recounted.

On March 12, 1962 a revolution shook the French Académie des Sciences when the first woman, Marguerite Perey (1909–1975) [1–4] (Figure 1), discoverer of francium (Atomic No. 87) [5], the last naturally radioactive element to be discovered, was elected to that venerable institution. The academy was founded in 1666 by Jean-Baptiste Colbert (1619–1683) when Louis XIV (1643–1715) was King of France. After several reorganizations, it was regrouped with four other academies into the Institut de France. Although the institute's procedural rules did not specifically exclude the nomination of women, until 1962 no woman held a seat at any academy.

The Academies' Traditional Prejudice

Even Nobel Prize winners could not overcome this traditional prejudice. In 1910 Marie Curie (1867–1934), who shared the 1903 physics prize with Pierre Curie (1859–1906) and (Antoine) Henri Becquerel (1852–1908), was the first female candidate at the Académie des Sciences. Her husband, Pierre Curie, had been elected on July 3, 1905, nine months before his tragic death. He was replaced by Désiré Jean Baptiste Gernez (1834–1910), a former student of Louis Pasteur's. When Gernez died, Marie Curie and Edouard Branly (1844–1940), a physicist and professor at the Catholic Institute, renowned for his work on the wireless telegraph, competed for the seat. Madame Curie lost by only two votes [6]. She never again put herself forward as a candidate even after receiving an unprecedented second Nobel Prize, this time in chemistry (1911). On the other hand, in 1922 she was elected to the Académie de Médecine, which is not a part of the Institut de France. Furthermore, Madame Curie's daughter, Irène Joliot-Curie (1897–1956), despite sharing the 1935 Nobel Prize in Chemistry with her husband, Frédéric Joliot (1900–1958), never became an academician. Incidentally, her husband was elected to the seat occupied for 29 years by Branly, the competitor of his mother-in-law, Marie Curie.

The Académie des Sciences' misogyny was—and still is—shared by other institutions. To date, only two women, other than Marie and Irène Curie, have received scientific Nobel prizes—Maria Goeppert-Mayer (1906–1972) (physics, 1963) and Dorothy Crowfoot Hodgkin (1910–1994) (chemistry, 1964). Another prominent figure in the field of radioactivity, Lise Meitner (1878–1968), had been nominated unsuccessfully for the Nobel award 20 times in physics and 21 times in chemistry, which represents half of all the nominations of women between 1901 and 1950 [7]. A tardy homage to her was rendered in 1987 when element 109 was named meitnerium.

Perey's Unexpected Fame

We may wonder if the unexpected event occurred at the right time and for the right person. In 1962 the mathematician Arnaud Denjoy (1884–1974) was President of the academy. In his investiture speech in January, 1962 he proposed a series of structural changes that may have included a less rigorous exclusion of women. Indeed, Perey was elected three months later in the physics section to replace Emile Henriot (1885–1961), Professor at the Universities of Brussels and Algiers, elected in 1947; the position was vacant since his death in February, 1961. Perey obtained 48 votes from 61 voters. Perey's competitor was P. Rouard, Dean of the Faculty of Sciences in Marseilles**.** The chemist Louis Hackspill (1880–1963), former President of the academy, immediately informed Perey, who at the time lived in Nice, of her election. In fact, her reputation had already been made as early as 1949 with her appointment to the new Chair of Nuclear Chemistry established specifically for her at the Université Strasbourg (Figure 2). However, at the time, outside of academic, mostly scientific, circles she was virtually unknown. Suddenly Perey's name appeared in media headlines. The discovery of francium may have been an important, but tardy, reason for her election to the academy. Perey also benefited from the support of a few members of the Protestant lobby and a few influential academicians who befriended her.

In 1939 Perey's discovery of francium remained completely ignored by the public. Laypersons had enough anxieties caused by the precarious political situation. Half a year earlier a war had been avoided just in time, and it was obvious that it was only a matter of a few months before the outbreak of hostilities with Germany. Furthermore, it was not the discovery of "francium" that was announced at the academy but of an esoteric "element 87, derived from actinium" [5]. Its discovery

[*] Series Editor contribution

[†] Marguerite Perey's first research student and successor

Figure 1. Marguerite Perey (1909–1975) in 1960.

Figure 2. Inaugural Lecture of Marguerite Perey in the Auditorium of the Institut de Chimie, Université Strasbourg, November 8, 1949. A specially drawn periodic chart emphasized the positions of francium and other radioelements.

interested only a handful of physicists and chemists or occasionally lecturers, who reported a few lines from scientific papers in national newspapers.

The academy had no definitive rule for discoverers of elements. The previously elected discoverer was lanthanide chemist Georges Urbain (1872–1938) in 1921 for lutetium, preceded *inter alia* by Antoine Jérome Balard (1802–1876) (bromine), and Nicolas Louis Vauquelin (1763–1829) (beryllium and chromium). Discoverers of elements who failed to be elected included Bernard Courtois (1777–1838) (iodine), Eugène-Anatole Demarçay (1852–1904) (europium), and even Paul Émile Lecoq de Boisbaudran (1838–1912), who had honored France with gallium—Mendeleev's eka-aluminum (after *Gallia,* the Latin name for France) [8].

The Media Frenzy

The newspaper headlines announcing the "First Woman Academician" overlooked two details. Perey was elected as a corresponding (*correspondant*) member, not a full member. Such second-rank members have no "academician seats" or other prerogatives of full members and do not bear the official title of *académicien*. On the other hand, they possess the right to deny the acceptance of papers submitted for publication in the academy's weekly *Comptes Rendus.* Also, the sole title *académicienne* bestowed on Perey in the media without additional detail was misleading. The title is implicitly reserved for the 40 "immortal" members of the Académie Française, the most prestigious branch of the Institut de France, which gives "a faithful picture of the talent, intelligence, culture, literature, and scientific imagination that make France" [9]. Pictures of the "immortals" and members of other academies in green dress with cocked hat, cape, and sword are very familiar. After Perey's election these gentlemen—and also the media—wondered about a female academician's dress. In fact the anxiety was really not a problem because corresponding members were not entitled to wear the costume.

In 1966 the 300th anniversary of the Institut de France was celebrated with pomp in the presence of President Charles de Gaulle. Perey took the occasion to make her official entrance at the Académie des Sciences. At the time she was the only woman among the five academies that constitute the Institut de France. Perey was conscious of the importance of her exceptional distinction and said,

> These gentlemen academicians were indeed very courageous to open their door to a woman….I am deeply moved….I have the impression of having broken down the last doors that were still closed for women [10].

André George, a newspaper columnist**,** raised the question, "Does Perey's election mean that the door will now be half-opened for future female academicians? Not certain at present! Nevertheless, it can be conceived that in case the Institut de France would elect women, it would first be at the Académie des Sciences" [11]. The columnist was correct. After Perey's election it could be expected that other female nominees would follow. Nevertheless, it was only 16 years later, on March 13, 1978, that a second woman, physicist Yvonne Choquet-Bruyat (b. 1923), was elected, also as a corresponding member, to the section on mechanical and computer sciences. The following year she was appointed a full member and thus became the very first woman to hold a seat at the academy. During the next 25 years the masculine prejudice was slightly lifted, and today a dozen women are counted among the 180 titular members of the Académie des Sciences, while four women are presently "immortals" [9].

Within 13 years two "scoops" had lifted Perey from anonymity to worldwide fame, as newspapers and magazines had a field day with her election. Suddenly she became famous with the revelation of her work with Marie Curie and Irène Joliot-Curie at the Institut du Radium, the discovery of a new element, and her suffering caused by irradiation. The "Marie Curie syndrome" was particularly acute because of Perey's assumed role as Curie's *préparateur particulier* (personal laboratory assistant). Perey often stated, "I owe everything to Marie Curie" [12], and throughout her entire life she declared her immense gratitude and devotion to her mentor's memory. Perey loved to evoke her time with Madame Curie even more frequently during her last years when she was one of the few survivors who had worked with the great woman scientist.


CES FRANÇAISES ETONNENT LES FRANÇAIS

Un reportage de Fred LOMONT

La jeune chimiste qui découvrit «l'élément 87» n'a qu'un regret: *ne plus pouvoir jouer du Chopin*

Les terribles morsures des corps radioactifs, que Mlle Marguerite Perey manipula durant vingt ans avec Mme Curie, lui ont meurtri la main gauche

Figure 3. "The young chemist who discovered element 87 has one sole regret: never again being able to play Chopin. The dreadful bitings of radioactive substances handled during 20 years with Marie Curie have injured her left hand." (*France Soir*, December, 1950).


Une Française, Marguerite Perrey martyre de la science, est la vedette de la Conférence atomique internationale qui se tient à Copenhague

(De notre envoyé spécial Jacques BERGEAL)

COPENHAGUE, 6 septembre (par téléphone).

HUIT CENTS atomistes de quarante pays participent, à partir de ce matin et jusqu'au 17 septembre, au palais « Odd Fellow » de Copenhague, à une vaste conférence organisée par l'Agence Internationale de l'Energie Atomique, en collaboration avec l'U.N.E.S.C.O.

Cette réunion, baptisée « conférence sur l'utilisation des radio-isotopes », a pour but d'éclairer tous les techniciens et les industriels du monde entier des immenses perspectives ouvertes à l'humanité par les substances radioactives dans tous les domaines. Déjà, plusieurs milliers de milliards ont pu être économisés grâce à cet emploi.

Une première table ronde avait eu lieu à ce sujet à Paris en 1957. Mais, depuis ce temps, de très grands progrès ont été faits. Il s'agit donc de faire le bilan des dernières travaux et d'envisager ceux encore à venir. 150 communications vont être présentées.

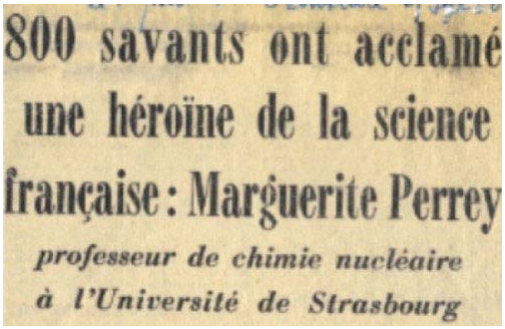
56 Américains, 19 Russes et 70 Français

Là encore, Russes et Américains vont nombreux (56 Américains et 19 Russes) entrent en compétition et se partagent les révélations pour les plus importants travaux. Mais, en dépit des aspects toujours renouvelés du match scientifique U.S.A.-U.R.S.S., la vedette de cette conférence atomique est une femme : Mlle Marguerite Perrey, martyre de la science atomique, et qui figure parmi les 70 membres de la délégation française.

Marguerite Perrey avait découvert le « francium »

Juste avant la dernière guerre, Marguerite Perrey découvrit un nouvel élément radioactif : le francium. Aujourd'hui elle fait partie du Centre de recherches nucléaires de Strasbourg. Mais ses longs travaux sur la radioactivité lui ont, à plusieurs reprises, provoqué de profondes lésions. Il y a quelques mois encore, elle subissait une nouvelle intervention chirurgicale. Aujourd

Figure 4. "A French woman, Marguerite Perrey [*sic*], a martyr of science is the star of the International Atomic Conference held in Copenhagen."


800 savants ont acclamé une héroïne de la science française : Marguerite Perrey

professeur de chimie nucléaire à l'Université de Strasbourg

Figure 5. "800 scientists have acclaimed a heroine of French Science: Marguerite Perey, Professor of Nuclear Chemistry at the Université Strasbourg."

Media Reports

Perey's nomination to the chair at the Université Strasbourg led newspaper and magazine journalists to regale the public with extravagant and occasionally false information. Even Perey's name was misspelled as Pérey, Perrey, Perret, Perez, Pérez, and other variations. One of the first extravagant reports appeared in the series "Frenchwomen who astonish the Frenchmen" (Figure 3). Because sources of informationavailable to the press were scarce, the same true or invented stories were repeated again and again with particular emphasis on radiation disease. Here are a few excerpts from various newspapers and magazines relating facts about Perey. We have added appropriate comments where needed:

> From 1929 to 1949 at the Institut du Radium she was one of Marie Curie's most valuable collaborators [Curie died in 1934, and the collaboration lasted 3 to 4 years].
>
> She submitted a thesis in 1935 [Francium was discovered in 1939].
>
> She underwent 12 operations [untrue].
>
> Since 1951 her two arms suffered a 60% paralysis, she lost two fingers [untrue].
>
> She had a thumb amputated [untrue; Perey lost one phalanx].
>
> To date [1960] she works every day with radioactive substances [Perey had to interrupt her research in 1952].
>
> Perey participated in the discovery of artificial radioactivity with the Joliot-Curie couple [untrue].
>
> Her father was killed in 1918 [He died on March 12, 1914]. He was a Pastor in the Protestant church [He owned a flour mill].
>
> Her name figures in the martyrology of science…
>
> Heroine of radiology, first woman at the Académie des Sciences, became infirm in the service of science…
>
> The most extraordinary and moving figure in contemporary science

But the discovery of francium itself had nearly been forgotten among these stories. In 1960 Perey attended a scientific conference for the last time—"Uses of Radioisotopes in Science and Industry," held in Copenhagen and organized by the International Atomic Energy Agency (IAEA) and the United Nations Educational, Scientific, and Cultural Organization (UNESCO). The media seized the opportunity for a new scoop on Perey (Figures 4 and 5).

Perey's election to the Académie in 1962 was announced in huge headlines (Figures 6–8). Comics in children's books illustrated the tale of Perey's life with more or less accuracy, but they insisted on citing her difficult childhood, her courage, her eagerness to learn, her disease, and her discovery as examples of her probity and humanity.

One of these stories about Perey appeared in three successive issues of the weekly magazine *Fripounet et Marisette* in December, 1961, many years after the excitement aroused by her appointment at the Université Strasbourg and only a few months before her election at the Académie. The story's title, "Perette et l'Atome," was based on Perey's nickname at the Institut du Radium, and it recalled the familiar fable well known to French schoolchildren, "Perrette et le pot au lait" (Perrette and the Milk Jar), by fabulist Jean de la Fontaine (1621–1695). The second installment of the story,

which appeared on December 7, 1961 is reproduced here (Figure 10).

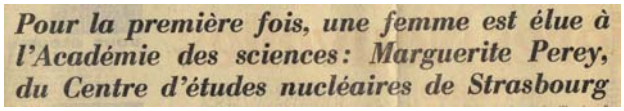


Figure 6. Headline of the local newspaper in Strasbourg: "For the first time a woman is elected at the Académie des Sciences." March 13, 1962.

Figure 7. "Last night in a Villa at Gairaut where she follows a medical treatment, *Nice Matin* [the local newspaper] informed Marguerite Perey, the famous scientist discoverer of francium, on her election as the first woman at the Académie des Sciences." Beneath the picture: "the intense joy of Marguerite Perey at the news of her election at the Académie."

Figure 8. Marguerite Perey in her living room at Nice-Gairaut.

The story begins with a picture of Perette (Perey) standing before the dying Marie Curie, who is urging the young woman to pursue personal research. Five years later a newspaper announces Perey's isolation of element 87. Three famous professors or academicians cannot believe it: "Impossible and unthinkable! A technician without a diploma discovered what we have been seeking for ten years? She does not even possessthe baccalauréat!" For three years Perey pursues her studies in secret, and her success is celebrated with champagne at the Institut du Radium: "She is our new Marie Curie!" During the celebration Perey must hide her pain. For four years she has known that the sickness of the atom has struck her. A physician suggests cutting the sympathetic nerve to ease her pain, but Perey says, "I would not heal; the atom never forgives." Science will be her only life. A family is excluded: "I have no right to transmit a life damaged by atomic radiations." She pursued her work despite her suffering: "Now I have to discover the uses of francium for the benefit of humanity." The installment ends with the question: "Will her disease leave enough time to achieve this mission?"

A more romantic picture story was headed "Fille de France" (Figure 11).

The female professor and *correspondant* of the Académie was honored with several national distinctions and awards, including the prestigious Prix Lavoisier of the Académie des Sciences, Médaille Lavoisier of the Société Chimique de France, and the Grand Prix of the City of Paris.

Progress over Prejudice

Feminist groups in particular praised Perey's election. A century earlier—in 1861—the first woman received the baccalauréat, the diploma awarded on graduation from the *lycée* (high school) required for matriculation at a university. Militant feminist Julie Daubié (1824–1874) was 37 at the time. She studied alone, with the help of her brother, a priest, who coached her in literature, Latin, and Greek. She had to fight furiously for permission to take the examination. Her request was rejected by the Rector of the Université de Paris, who considered it to be "presumptuous and would ridicule the University and himself." Daubié pursued her struggle and eventually passed the examination in Lyons. Five years later, a second woman obtained the diploma. In 1880 Camille See (1827–1919), a politician in charge of education, established high schools for girls, but in the French National Assembly he declared that "women should not make use of their diploma or pretend to enter university faculties" [12]. In actual practice, teaching of the "noble" subjects such as Greek, Latin, and philosophy were omitted although they were compulsory for the preparation for the *baccalauréat*. Forty years later a second-rank *baccalauréat* specifically for girls was established. Until 1938 married women needed permission from their husbands to study at the university.

Nobel laureate Marie Curie, the first woman professor at a French university in 1906, and Marguerite Perey, the first female *correspondant* at a French academy, are symbolic and pivotal figures in the long struggle for the emancipation of women, especially in the sciences. In 1980 at the Institut de France, the prestigious *Académie Française* finally surrendered and relinquished its long-held masculine prejudice with the election of the first "immortal" woman, the French and American historian Marguerite Yourcenar (1903–1987). In September, 2005 Alice Dautry-Varsat, age 55, a chlamydia researcher who was Head of the Biology of Cell Interactions

Figure 9. Marguerite Perey next to the building of the Institut de France, Quai Conti, Paris.

Figure 10. "Perette et l'Atome," 2nd installment, *Fripounet et Marisette,* December 7, 1961.

Figure 11. First pictures of the story "Fille de France." The story begins with the young Perey in her first modest role at the Institut du Radium, cleaning the laboratory shelf and glassware. She has the unique chance of working with Marie Curie, and the great scientist rapidly notices the young technician's skill, eagerness to learn and passionate interest in science.

Unit of the Institut Pasteur, was named the new President of the Institut, the first woman to be so honored in the Institut's 117-year history. Although the contributions of women to society have been increasingly recognized, and their advancement to spheres formerly denied to their sex has occurred more frequently, the battle is far from won, and additional efforts to overcome traditional male prejudice are still required.

Acknowledgment. References 11 and 13 and Figures 1–11 are reproduced from the Perey Archives collected by Jean-Pierre and Madeleine Adloff, collaborators of Marguerite Perey, and transferred to the Physics Archives of the Université Louis Pasteur, Strasbourg (Courtesy, Sébastien Soubiran, Archives scientifiques, Mission culture scientifique et technique de l'Université Louis Pasteur, 7 rue de l'Université, 67100 Strasbourg, France).

References and Notes

1. Kauffman; G. B.; Adloff, J.-P. Marguerite Perey and the Discovery of Francium. *Educ. Chem.* **1989**, *26*, 135–137; reprinted in *Chemists through the Years: Part II*; Servant, D., Ed.; "Chemistry, Industry and Society" Series; The Royal Society of Chemistry: London, England, 1994**;** pp 152–154.
2. Kauffman; G. B.; Adloff, J.-P. Marguerite Catherine Perey (1909–1975). In *Women in Chemistry and Physics*; Grinstein, L. S; Rose, R. K.; Rafailovich, M. H., Eds.; Greenwood Press: Westport, CT, 1993; pp 470–475.
3. Kauffman; G. B.; Adloff, J.-P.; Niinistö, L. Marguerite Perey ja radioaktiivisen frankiumin löytö luonnosta (Marguerite Perey and the Discovery of Naturally Occurring Radioactive Francium). *Kemia-Kemi* **2000**, *27*, 231–233 (in Finnish).
4. Adloff, J.-P.; Kauffman, G. B. Marguerite Catherine Perey (1909–1975). In *Out of the Shadows: Contributions of 20th Century Women to Physics*; Byers, N.; Williams, G., Eds.; Cambridge University Press: Cambridge, England, 2005; pp 371–384.
5. Perey, M. Sur un élément 87, dérivé de l'actinium. *Compt. rend.* **1939**, *208*, 97–99. Most of this paper appears in English translation in Davis, H. M. (revised by G. T. Seaborg) *The Chemical Elements*; 2nd ed.; Science Service: Washington, DC, 1959; pp 26–28.
6. Blanc, K. *Marie Curie et le Nobel*; Uppsala Studies in the History of Science 26; Office for History of Science, Uppsala University: Uppsala, Sweden, 1999.
7. Crawford, E. *The Nobel Population 1901–1950: A Census of the Nominators and Nominees for the Prizes in Physics and Chemistry*; Universal Academy Press: Tokyo, Japan, 2002.
8. It has been suggested that Lecoq de Boisbaudran surreptitiously named the element for himself (*gallus*, Latin for cock (Lecoq)), but in the announcement of the discovery he clearly stated, "On the 27th of August 1875, between 3 and 4 o'clock in the afternoon, I found the first indications of the existence of a new element, which I have named 'gallium' in honor of France (Gallia)" (de Boisbaudran, P.-E. L. Sur un nouveau métal, le Gallium. *Ann. Chim.* **1877**, [5]*10*, 100–141. Excerpts from this paper appear in English translation in Davis, H. M. (revised by G. T. Seaborg) *The Chemical Elements*; 2nd ed.; Science Service: Washington, DC, 1959; pp 93–94).
9. The Académie Française, the French literary academy, was established by first minister Cardinal de Richelieu in 1634, incorporated in 1635, and, except for an interruption during the era of the French Revolution, has existed to the present day. Its original purpose was to maintain standards of literary taste and to establish the literary language. Its membership is limited to 40 members (the "immortals"). Among the numerous European literary academies, it has consistently maintained the highest prestige over the longest period of time. Presently the four "immortal" women and the years of their election are Jacqueline Worms de Romilly (1988), Hélene Carrère d'Encausse (1990, perpetual secretary 1999), Florence Delay (2000), and Assia Djebar (2005).
10. M. Perey, M., letter to J.-P Adloff, June 26, 1966.
11. George, A. *L'Académie des Sciences a trois cents ans* (1966).
12. Perey, M., in her scientific *curriculum vitae* and several interviews.
13. Cited in the *Journal du Dimanche*, August 6, 1972.