

At the Métropole, a “Witches’ Sabbath”

Autumn 1911, Brussels. A mythic congress, a phenomenal cast: Albert Einstein, Marie Curie, Henri Poincaré, Max Planck, Paul Langevin, Maurice de Broglie and others reinvent science during the Solvay Congress, in the most beautiful hotel in the city.

“Well, here it is!” Patrick Wielmans opens the door of the *Salon Einstein*. On the first floor of the *Métropole*, to the right of the monumental staircase traversing the imposing building on the *place de Brouckère*, in the historic centre of Brussels, the meeting room is not very impressive. About forty square metres, a bit of marble on the wall, a long table in the middle. Compared to the splendour of the *grand hôtel*, nothing very spectacular. Nevertheless, this place is the pride of both the establishment and its chief.

In was in this room, recalls Patrick Wielmans, that one of the most famous pages in the history of science was written. During the four days between 30 October and 3 November 1911, at the invitation of the industrialist and philanthropist Ernest Solvay, a score of the most brilliant spirits of the twentieth century filled these walls with esoteric reflections on the profound nature of matter and energy, opening the way to modern physics—that which has given electronics, informatics, the internet, atomic fission and so on, which, for better or for worse, have moulded our epoch, and will mould future epochs. This meeting, which has achieved a mythic status, the first Solvay Congress, was not only where a new physics was launched. According to the physicist and philosopher Etienne Klein (CEA), “*It profoundly changed the way in which science was done*”.

Was it really in this small room that everything happened? In reality, Patrick Wielmans is not completely certain. He inherited the information from his father, who himself inherited it from his grandparents, the founders of the *Métropole*, who were also the hosts of the famous congress. “*Let us say that we are perhaps 90% certain*”, he suggests. Opposite, in the same corridor, the *Salon Langevin* is also a possible candidate.

The single image of the Solvay Congress, which will be the first in a long series, is a celebrated group photograph. It does not let us decide with certainty between the two salons: However it is not the place which one wishes to immortalise, but the phenomenal casting of the event. Twenty four scholars, whose names form, a century later, a major part of scientific textbooks: Albert Einstein, Marie Curie, Paul Langevin, Henri Poincaré, Max Planck, Hendrik Lorentz, Arnold Sommerfeld, Marcel Brioullin¹, Ernest Rutherford, Jean Perrin, James Jeans. . . . Almost half of the participants have, or will have, a Nobel Prize. Marie Curie will have two of them.

What are the greatest scholars of their time doing in a luxury hotel in Brussels? Who called them together, and why?

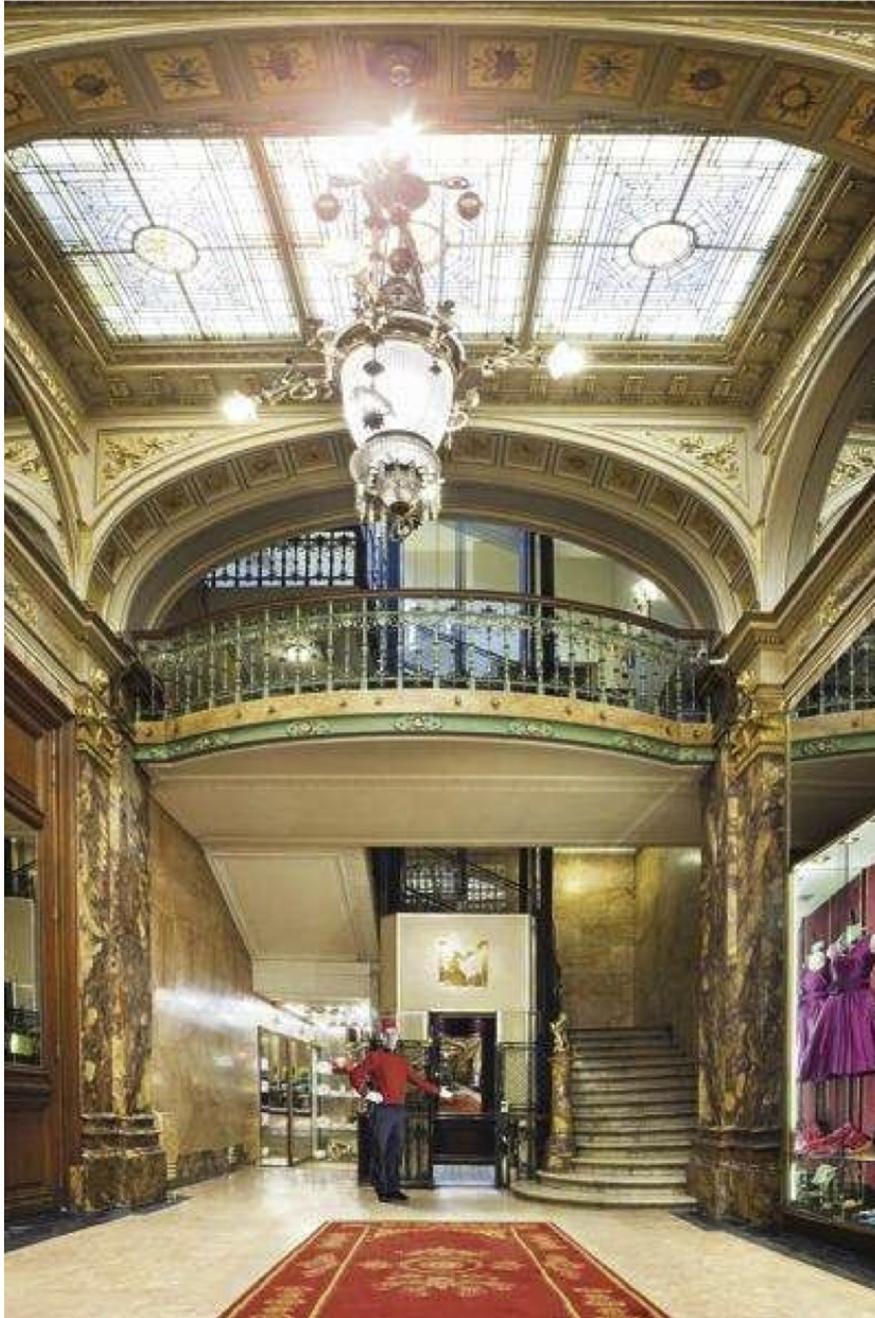
AN “ACT OF DESPAIR”

In reality the story started eleven years earlier. In 1900, Max Planck formulated a theory based on a revolutionary idea: radiation and matter can only change their energies in the form of little indivisible packets. The idea of “quanta of energy” was born. The German physicist had not found any alternative to describe certain experiments. But his theory, a complete break with the classical approach, seemed to him so unreasonable, that he described it himself as an “Act of Despair.”

Initially, it aroused little attention. But five years later, a young engineer in the Bern patent office, a certain Albert Einstein, took up and further radicalised Planck’s idea: it was not only the energy exchanges which were granular, but the very nature of radiation. Light itself should be composed of small granules of energy, the famous quanta, which would not be called “photons” until much later. . . .

A third person, much less famous than Einstein or Planck, then played a key role in the genesis of the Solvay Congress. In 1906, a German physicist and chemist, Walther Nernst, for his part had established a “heat theorem”, which he was trying to validate by means of an ambitious series of experiments. Very rapidly, Nernst realised that his work achieved its full significance only within the framework of quanta.

¹The father of Léon Brillouin, inventor of Brillouin zones



“Walther Nernst was very ambitious”, recounts Franklin Lambert (*Vrije Universiteit Brussel, Instituts Solvay*), physicist, historian of science, and passionate exegist of this key moment in physics. *“He wanted the Nobel Prize. But he knew that, for this, quantum theory, at that stage very controversial, had to be validated at the highest level.”* For his own genius to be recognised, it was necessary that the ideas of Planck and Einstein be recognised beforehand.

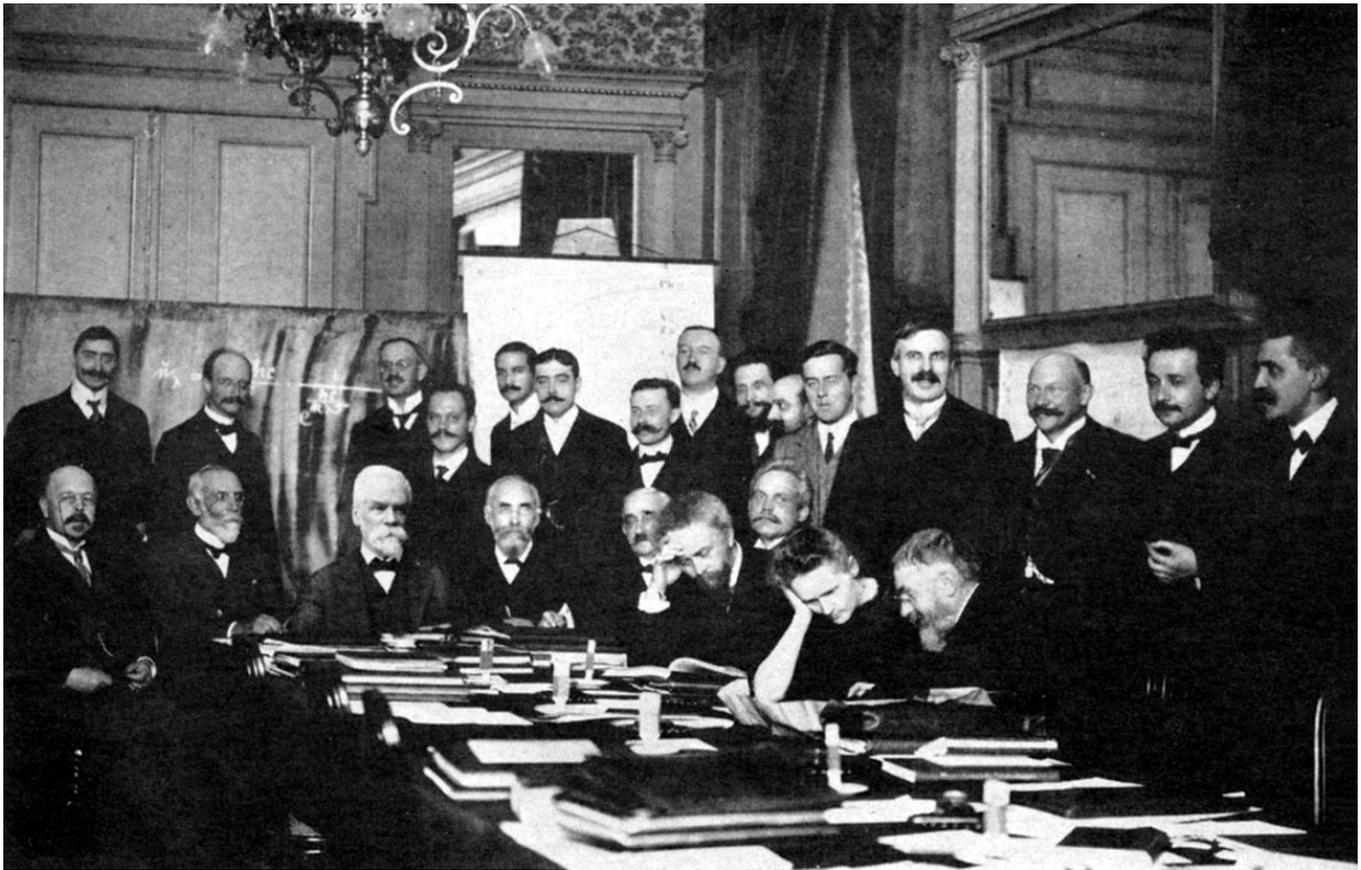
Organise a conference at his place, in his institute in Berlin, to make the theory of another German be

accepted, and thus consolidate his own works? *“Nernst understood well that this would be too obvious”* says Franklin Lambert. *“He knew he had to find another solution.”*

Nernst’s *“solution”* was called Ernest Solvay. This man, a wealthy chemical-industrialist, a social and humane philanthropist, was one of the great patrons of his times. A brilliant self-taught man, he had discovered a method for the synthesis of soda, and in 1863 founded the society which carries his name. It is still, a century and a half later, one of the finest jewels of the European chemi-

cal industry.

Solvay was above all in spirit himself a scholar, the author of some remarkable intuitions, such as the idea of the equivalence between matter and energy, which he would formulate in 1887, eighteen years before a certain Albert Einstein would establish it, incarnating it in the most celebrated formula of physics ($E = mc^2$). Loving knowledge, and strongly wishing to advance learning, he founded an institute for physiology at the *Université libre de Bruxelles* in 1894, then a school of commerce, an institute for sociology...



The first Solvay conference met in November 1911 in the *Hotel Métropole* in Brussels. 24 scholars. Seated, from left to right: Walther Nernst, Marcel Brioullin, Ernest Solvay, Hendrik Lorentz, Emil Warburg, Jean-Baptiste Perrin, Wilhelm Wien, Marie Curie, Henri Poincaré. Standing: Robert Goldschmidt, Max Planck, Heinrich Rubens, Arnold Sommerfeld, Frederick Lindemann, Maurice de Broglie, Martin Knudsen, Friedrich Hasenöhrl, Georges Hostelet, Édouard Herzen, James Jeans, Ernest Rutherford, Heike Kamerlingh Onnes, Albert Einstein, Paul Langevin.

NEUTRAL TERRITORY

Walther Nernst went to see Ernest Solvay with a proposal to help in the resolution of the crisis then being experienced within physics. The crisis was real: Classical theory no longer permitted any explanation of certain phenomena, and there was no consensus in favour of quantum theory. *“Ernest Solvay himself understood the reality of this crisis, and wanted to participate in its resolution”*, explains Jean-Marie Solvay, his great-great-grandson, who to this day continues to organise these “summit meetings” on physics and chemistry.

Solvay enthusiastically adopted Nernst’s idea: Bring together the great scholars, let them confront each others’ ideas, and come to agreement about the reality of the famous quanta. But he amended the list of invited participants proposed by

Nernst and added several French scientists who had not originally been on the programme: On the insistence of the patron, Marie Curie, Marcel Brioullin and above all Henri Poincaré were to participate. This choice would be decisive.

As to the location, this decision was automatic. Solvay was Belgian, the meeting would take place in Belgium, neutral territory, the crossroads of Europe, frontier between the germanic and latin cultures. Brussels, capital of developing internationalism, would be the the city of the conference. And if Brussels was the conference city, then the Métropole was the obvious choice of venue.

“At that time there was simply no other luxury hotel in Brussels”, comments Patrick Wielemans. In 1911 the establishment was already an institution. Founded in 1894 by the Wiele-

mans, a major family of brewers, who at the turn of the century were investing in restaurants and hotels, the establishment was a jewel of *Art Nouveau*. In 1891 the Wielemans brothers had purchased the grand building with an imposing white facade in the style of Haussman on 31 Place de Brouckère, in which was located the General Bank for Savings and Pensions. They entrusted the transformation into a *hôtel de luxe* to the architect Gédéon Bordiaux, and the decoration and interior design to Alban Chambon. They gave them complete freedom in their tasks.

The result was a cathedral—but a cathedral illuminated by electricity and heated by steam. Columns, arcades, stained glass, mirrors and gilding throughout, domed ceilings, huge chandeliers; bronze, stucco, rare woods, wrought iron, *brèche² de*

²In English *Numidian breccia*, a highly decorative North African stone

Numidie...

Chambon drew inspiration from the French Renaissance for the vestibule, from the Italian for the grand ballroom, from Hindu art for the reception area, from the English style for the office and its lengthy teak counter, behind which glitter, even today, rows of heavy and beautiful silvered keys that the direction of the hotel has decided to preserve in spite of the sad modern fashion of magnetic cards...

Each square metre of wall or ceiling, each capital on a column is a witness to talent and to hours of work of hundreds of artisans. "When you see the minutiae of the ornamentation, the care taken with the smallest element of decoration, you know that we will never again go so far in such attention to detail. It is something which we have lost," judges the architect and designer Hervé Langlais, artistic director of the *Galerie Negropontes*. This syncretism, this polifera-tion could be overbearing. It is nothing of the kind. All the way to the entry to the elevator—fabricated by the french company Edoux, who also made the Eiffel tower—the visitor always has above him five, six, sometimes seven metres to the ceiling.

"When you dream that you might imagine new physical theories, this is perhaps something that could help", suggests Patrick Wielemans. He couldn't have said it better. "Initially the scholars were to reside in the hotel, and hold their meetings in the lecture hall of the Institute for Physiology in the Parc Léopold, but they preferred to stay where they were", observes Patrick Lambert. These people were not simply spirits. On the second day of the conference, Arnold Sommerfeld wrote to his wife that the place where they were lodged was "wonderfully chic". "Each of us has a private bath and toilet in our room" he noted. "I have a bath each morning. We are the guests of M. Solvay, and this includes the meals. No less than five courses at each dinner! It's crazy!"

Another of the German physicist's reflections to his wife speaks volumes about the novelty of the con-

ference: "Yesterday evening I had a Frenchman on my right and an Englishman on my left, and I was speaking to them both, one after the other!" Sommerfeld's astonishment in the face of what is today commonplace shows that here Solvay invented a new way of doing science: international, convivial and disengaged from political considerations. For to put together German, French and English scholars around the same table was not at that time an anodyne event.

NO-ONE SAW THINGS CLEARLY

There were other problems: at that time there was no language like the English of today, which could serve as a scientific *lingua franca*. But, by chance, Hendrik Lorentz, who presided over the meeting, was not only a great physicist; he was also a talented polyglot. He translated on the fly and facilitated exchanges, passing from German to French, from English to Dutch...

The conviviality of the first Solvay conference certainly played a significant role in its success. "Einstein was only 32, and for him this congress was a way of making his official entry into the scientific community" recounts Franklin Lambert. "He would tie bonds of friendship, with Marie Curie for example, and would receive letters of recommendation from several of the participants to get the position in Zurich that he coveted."

These letters also show, notes the science historian, that the young and enthusiastic Einstein "fascinated the other participants in the conference by the breadth of his knowledge and the depth of his analysis of problems." "In reality, one can say that his career was launched by the first Solvay conference," adds Franklin Lambert. However, Einstein left the conference feeling disappointed, describing it, in a letter to his friend and confidant Michele Besso, as a "witches' sabbath". At the end of the meeting, he wrote to Besso: "No-one saw things clearly. In all of this there would enough to delight a company of demonic Jesuits."

The young Swiss physicist de-

plored Planck's persistence in rejecting the idea of light quanta, because this would lead to the reform of Maxwell's and Lorentz's theory of electromagnetism. He was also disappointed with Poincaré's skepticism. But he was mistaken—being a great physicist does not prevent you being a mediocre psychologist. On returning to Paris, what he had heard at the Métropole continued to concern the great French researcher. And in 1912 Poincaré published an article supporting Planck's theory. In fact, his prestige was such that his conversion would play a major role in the acceptance of quantum theory by the majority of the scholars.

The conference left numerous questions open, but it tilted the balance in favour of a new physics. "All historians of modern physics highlight the decisive significance of the first Solvay conference for the start of a collective awareness of the importance of quanta, and for the progress of the quantum theory", write Pierre Marage and Grégoire Wallenborn in *La Naissance de la physique moderne racontée au fil des conseils Solvay* (Ed. de l'Université libre de Bruxelles, 2009)³. Quanta would be central to a new theory—bizarre and counterintuitive—quantum mechanics, which would wait another two decades before emerging definitively.

After the the first Solvay conference, a formal proceedings of more than 400 pages would be published, in French, and this has still not been translated in full into English... It says nothing about the way in which the debates developed. What questions were posed? By whom? At what moment? The answers to such questions have not really been treated by historians of science. However, they do exist.

During the conference the French physicist Maurice de Broglie⁴ who acted as secretary to the conference, retrieved all of the little notes taken on the spot by scholars during their debates, organised them and pasted them into a notebook together with his own commentaries—a unique testimony of what was said in the

³English version "The Solvay Councils and the Birth of Modern Physics", Springer 1999

⁴The Brother of Louis de Broglie, inventor of wave-particle duality

Métropole during those days. . . . This register now resides at the *Institute de France*. It has not revealed all its secrets, and the Solvay Institutes make no secret of their desire to obtain a copy for their archives.

MEDIA LYNCHING

As to those of the Métropole, they have disappeared, probably destroyed during the Second World War. Who slept in which room? We will never know. It is hardly important, however, it was the only question which, at that time, interested the press. And in particular, the conservative press.

Because, on 4 November 1911, on returning from Brussels, Marie Curie found, assembled in front of her house at Sceaux, a small gathering. A hostile crowd was shouting insults at her. The nationalist daily *le Journal*, with one of the largest circulations, had just revealed on its front page her liaison with Paul Langevin. She had been a widow for five years, and he was separated from his wife, but Fernand Hauser, the author of the article, did not care. He put ev-

erything up for auction. He should really have asked the two scientists for their reactions, but, he wrote, “*Madam Curie cannot be found, and no-one knows where Monsieur Langevin is*”. While he had been polishing his scandalmongering, the two scholars had been in Brussels, with their scientific peers, discussing quanta.

In the “lynching” which followed in the coming weeks—in spite of her second Nobel prize, announced on 7 November—newspaper readers mainly remembered that Marie Curie and Paul Langevin were, together, in a luxury hotel in Brussels. . . .

Fernand Hauser would finish by making, publicly, a sincere apology to Marie Curie for having ignited the inferno. Too late. *L’Œuvre et L’Action française* fed the scandal and slammed *the foreigner, the Pole* (she was born in Poland), *the adulturous widow*, and, playing on the antisemitism of their readers, went all the way up to inventing Jewish origins for her. This affair was not exactly the high point of the profession. “*No newspaper spoke, at that time, about the first Solvay conference in*

terms of what it really signified for the future of physics”, recalls Marina Solvay, great-great-granddaughter of Ernest Solvay, who is currently finalising a book on the subject. “*All that was seen was a woman surrounded by men*”.

On 23 November, from Prague, Einstein wrote a beautiful letter to the French scholar, which showed that the first Solvay conference was also the crucible of solid friendships. He said he was “*furios*” about the wrong being done to her. “*I feel the need to tell you how much I have learned to admire your intelligence, your energy, and your integrity, and that I consider myself fortunate to have been able to meet you personally in Brussels*” he added. “*If this riffraff is still busying itself with you, simply stop reading this nonsense. Leave it to the vipers for whom it was manufactured*”.

Scholarly friendships spanning the Rhine, a new physics: the Solvay conference fulfilled its promises. And as for Walther Nernst, in 1920 he would receive his coveted Nobel Prize for chemistry. Two years after the great Planck had received that for physics, as the father of quanta.

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