

One of Henri Becquerel's historic 1896 exposures of radioactive material. Just visible is the outline of a metallic cross which had been placed between the sample and the photographic plate.

(Photo Commissariat à l'Energie Atomique)

the edge of supersymmetric WIMP expectations. The low temperature and discriminating liquid-xenon detectors may be able to attain the 10^{-1} to 10^{-2} event/kg/day rate in the next few years.

The meeting showed that the next key measurements to be made should be:

- a new satellite to make precise cosmic background radiation studies;
- more observations of the distant supernova las to measure the deceleration parameter;
- WIMP detectors in the 100 kg mass range; and
- resolution of the issue of the few electronvolt neutrino mass.

It is hard to imagine a more exciting discovery than that of supersymmetric WIMPs, implying that particle physics could once again be done in basement laboratories!

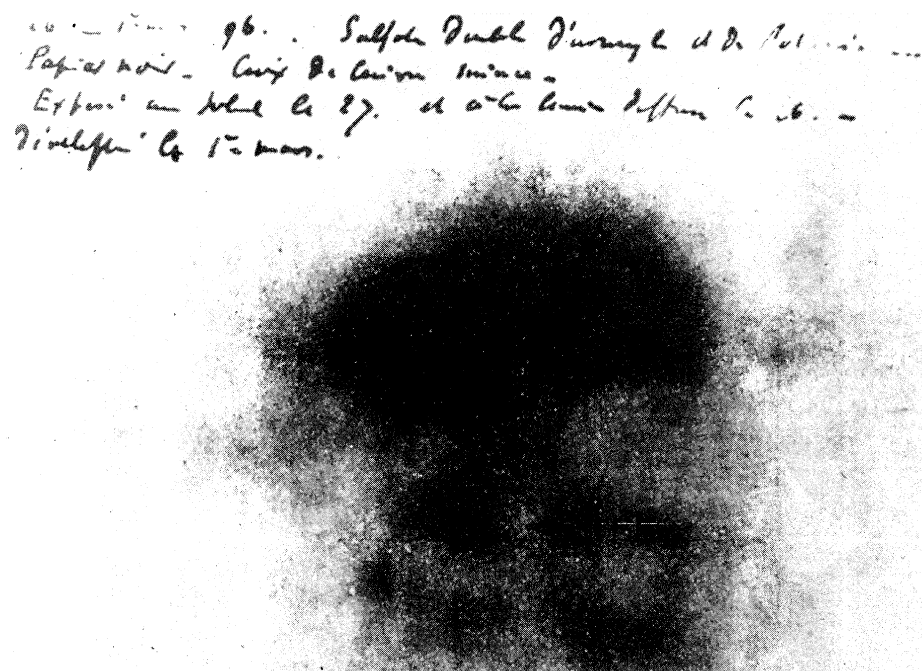
The proceedings of the symposium will appear in Nuclear Physics B this summer. The third meeting in this series will be held in Santa Monica, in February 1998.

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One hundred years ago...

Marking a century of atomic physics, an occasional series of CERN Courier articles looks back to what was happening 100 years ago.

Early in 1896, newspapers across the world were carrying the story of Wilhelm Röntgen's discovery of X-rays, illustrated with skeletal



photographs of famous people's hands. In Cambridge, Charles T.R. Wilson detected ionization from X-rays in his new cloud chamber device. The evident spinoff applications of X-rays were not long in coming - that summer X-ray pictures were used for medical and dental examinations.

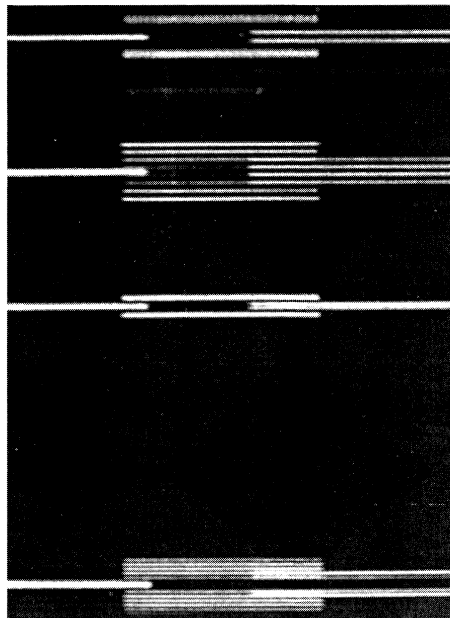
With the X-ray news, physicists all over the world stopped what they were doing and tried to understand the implications of the startling new developments. However this was difficult initially with only scanty press reports to go on. One of those interested was Henri Becquerel in Paris, the son and grandson of distinguished French physicists who had investigated luminescence.

Röntgen, aged 50, had covered a cathode-ray discharge tube with black paper and found that a fluorescent screen 2 metres away began to glow. Becquerel, aged 44, tried replacing the cathode-ray tube with a phosphorescent source

exposed to sunlight. The source contained a uranium salt. He wrapped a photographic plate in black paper to prevent fogging due to sunlight. The phosphorescent source was then placed on the wrapped plate and the whole exposed to the sun for several hours. The phosphorescent material cast a shadow on the plate, and this shadow could be affected by interposing an opaque object such as a coin between the source and the plate. Becquerel concluded that the phosphorescent substance emitted some kind of radiation capable of passing through the paper shroud.

Preparing another exposure with a copper mask between the source and the shrouded plate, Becquerel was disappointed when the sun went behind the clouds, preventing the standard exposure to induce phosphorescence, and hid the sample in a dark cupboard. But the clouds remained for several days, and Becquerel, tired of waiting, took

In 1896, Pieter Zeeman in Leiden acquired a precision diffraction grating and discovered the effect of magnetic fields on optical spectra. An ordinary spectrum (left) is split into many components.



out his sample and developed the plate. To his astonishment, the shadow of the copper mask was even sharper than those using sunlight-exposed plates. Needless to say he repeated the experiment several times. The source, even in the dark, emitted some mysterious radiation - Becquerel rays. This historic discovery was certainly helped by the dull weather in Paris in February 1896.

Becquerel systematically investigated their properties. Other uranium compounds which were not phosphorescent produced the effect, suggesting that the rays were due to uranium and not the phosphorescence, a suggestion confirmed by using metallic uranium.

The great Henri Poincaré summarized the puzzle in curiously prophetic words. Far from leading to a dead end, he declared 'one can think today that it will open for us an access to a new world which no one suspected,' and that other phenomena 'will doubtlessly...

complete a picture of what we barely begin to see the outline'.

Becquerel's work motivated in turn Pierre and Marie Curie to begin their historic analysis of heavy elements. In 1903 Becquerel shared the Nobel Physics Prize with the Curies for their work on radioactivity. He died in 1908.

Elsewhere in 1896, Pieter Zeeman in Leiden acquired a new diffraction grating and discovered the effect of magnetic fields on optical spectra. Guglielmo Marconi demonstrated wireless telegraphy (so did several other people, see October 1995, page 21). Common to these discoveries and to Röntgen's watershed X-ray discovery of 1895 (and in several subsequent milestone experiments) were Heinrich Rühmkorff's coil, a transformer-like device for producing high voltages, and the vacuum tube developed by Johann Geissler of Bonn. Rühmkorff and Geissler's research and development work seeded fundamental physics at the dawn of the 20th century.

On the theoretical side, a hundred years ago the 'standard model' of basic physics was statistical mechanics, and the precision study of 'black-body' radiation was its testing ground. In Berlin, Wilhelm Wien, working in Hermann von Helmholtz' institute, analysed the radiation emitted by an electrically-heated furnace and formulated a promising new equation which related the radiation's wavelength and temperature. His phenomenological expression, and another contemporary version by Lord Rayleigh at Cambridge, were improvements on previous attempts, but precision tests showed them to be deficient at certain wavelengths. However the radiation measurements had required considerable experi-

mental skill at Berlin, and this mass of precision data helped opened the door for Max Planck's subsequent equation and its quantum explanation. At lower wavelengths, Wien's and Planck's exponential equations do not look very different, but while Wien's approximation had two empirical constants, Planck's more complete version only had one.....

Albert Einstein, having failed the entrance examination for Zurich's ETH the previous year, studied at the Swiss cantonal school in Aarau before being admitted to the ETH in the fall of 1896.

'Solomon's House': Has particle physics made Francis Bacon's vision come true?

Francis Bacon, the English philosopher and politician who lived between 1561-1626, partly overlapping the reign of Queen Elizabeth I, was the first person to understand the importance of new knowledge and in particular the natural sciences to society. He considered the then dominant study of ancient philosophy as unproductive and retrospective, and believed that vast amounts of phenomena were yet unexplored. He was the first to argue that science ought to be organized, and the Royal Society of London, the earliest academy formally constituted in Europe, founded in 1660, adopted Francis Bacon's ideas (1).

During the last years of his life Bacon worked on his grand vision,