

## In memoriam Romain Coussement (1935–2012)

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On July 9th, 2012 Romain Coussement passed away at the age of 77. He was active in the Institute for Nuclear and Radiation Physics of the University of Leuven from its creation and chaired the institute from 1982 until his retirement in 2000.

Romain Coussement studied physics at the University of Leuven and obtained his master degree in 1959 with a thesis on ferromagnetism. For his doctoral studies he switched to nuclear physics and obtained his doctoral degree in 1964 with a study on “Influence of higher order contributions in allowed beta decay transitions”. His background in both solid state physics and nuclear physics would form the backbone for his future scientific activities.

When the University of Leuven decided to create a research institute in nuclear and radiation physics in the Flemish section of the university, the “*Instituut voor Kern- en Stralingsfysica (IKS)*”, in close collaboration with the “*Centre de Physique Nucléaire de Louvain (CPNL)*” of the French section of the university, Romain Coussement was one of the first professors to be appointed in IKS. He became associate professor in 1965 and was finally promoted to full professor in 1972. The close collaboration between IKS and CPNL would persist after CPNL moved to its new campus in Louvain-la-Neuve. For many years, Romain Coussement was chairman of the program advisory committee of the cyclotron at Louvain-la-Neuve and, under his impulse, members of the IKS set up many on line experiments at

the cyclotron in Louvain-la-Neuve. Moreover, Romain Coussement has several joint publications with the Mössbauer spectroscopy scientists from Louvain-la-Neuve.

In the late sixties IKS found its definite housing on the new science campus of the University of Leuven in Heverlee in a separate wing attached to the new physics building. This separate wing was meant to keep “radioactivity” somewhat separate from the rest of the physics department. It was in this wing that IKS developed its research programmes. Romain Coussement and his colleagues in IKS decided to acquire an isotope separator dedicated to the implantation of radioactive nuclei into solids. They were not the only ones in the scientific community to make this choice: also Bodenstedt and his colleagues at the University of Bonn and de Waard and his colleagues at the University of Groningen had chosen for this research line. For many years there followed a healthy competition between the three laboratories with many exchanges, collaborations, guest professorships and mutual visits. Although conceptually meant for nuclear physics studies, it was soon realized that a wealth of solid state physics information could be obtained from ion implantation experiments and over time a large part of the research output at IKS was dedicated to solid state physics.

There was a clear shift in the publication output from Romain Coussement. Before 1970 his publications were devoted to beta decay. From 1970 to 1982 Romain Coussement was co-author on almost 100 publications devoted to hyperfine interaction studies on ion implanted samples. There were a few nuclear moment determinations but mainly studies of hyperfine fields and implantation phenomena, first in ferromagnetic materials and later also in semiconductors and insulators. Several hyperfine interaction techniques were introduced at IKS. One of these techniques was Mössbauer spectroscopy and Romain Coussement managed to persuade the University of Leuven to attribute an honorary doctorate to Rudolf Mössbauer in 1976. Several young scientists who had obtained their doctoral degree in IKS were appointed as young faculty members, often after spending a number of years abroad, and they developed sophisticated spectroscopic techniques that made use of implanted radioactive sources: nuclear orientation (Vanneste, Silverans, Severijns), perturbed angular correlations (Rots), Mössbauer spectroscopy (Pattyn, Langouche), Rutherford backscattering and channeling spectrometry (Vantomme). Pure nuclear physics remained an important research topic at IKS as well, and found a new boost after a second ion implanter was acquired and installed on-line at the Louvain-la-Neuve cyclotron and two new faculty members (Huysse, Van Duppen) were appointed in IKS. They started their research work at the IKS-facility at the Louvain-la-Neuve cyclotron but soon expanded their horizon by participating in and setting up experiments at CERN-Geneva, GSI-Darmstadt, GANIL-Caen and many other research facilities all over the world. It was also under the impulse of Romain Coussement that IKS engaged in nuclear structure investigations using collinear laser spectroscopy.

1982 was a milestone in the career of Romain Coussement. He was elected chairman of the institute by the faculty members of IKS. He would remain chair until his retirement in 2000. By no means this meant that he would devote the rest of his career to administration. On the contrary. Around the same time he started a new research line in IKS, called *nuclear level mixing resonance spectroscopy*, a technique which he had personally developed. He was first author of the basic papers on this technique, starting to be published in 1983. More than 100 publications were

to follow. Romain was invited to present this technique at many institutions and to deliver plenary lectures on this topic at several conferences. He demonstrated that the level crossing and level mixing resonance methods are especially powerful to measure accurately the quadrupole interaction frequencies of nuclei with lifetimes between microseconds and minutes. He and his co-workers (Neyens would be appointed faculty member) managed to measure a large number of nuclear quadrupole moments of such states.

This was not the last development in the scientific career of Romain Coussement. His research on the level mixing concept had led him to the conclusion that this concept might be useful for the development of the gamma-ray laser. He published his first ideas in 1988, soon to be followed by more extensive publications. The fact that his gamma laser concepts drew the interest—and even some funding—from military agencies in the United States created some controversy with his colleagues in the early 1990's. More and more, he turned his attention to the fundamental aspects of nuclear radiation and became engaged in a research line called *nuclear quantum optics*, inspired by related phenomena in atomic physics. His pioneering publication on the non-reciprocity of gamma emission and absorption due to quantum coherence at nuclear level crossings appeared in 1993 in *Physical Review Letters* and had a large impact in the field. He kept publishing a number of theoretical papers, soon to be followed by experimental verifications at synchrotron radiation facilities in the USA and in Japan, on a number of topics as time-integrated nuclear resonant forward scattering of synchrotron radiation. These studies were often in collaboration with foreign scientists and many of his theoretical papers were in collaboration with Odeurs, who was appointed as temporary faculty member in IKS.

His original ideas on the level mixing resonance concept and nuclear quantum optics earned him one of the highest Belgian scientific distinctions. In 1995 he received from the king of Belgium the Prize of Excellence of the Belgian National Science Foundation. This Prize of Excellence in natural sciences is attributed every five years on the basis of the judgment of a fully international jury, and is also more formally known as the De Leeuw-Damray-Bourlart Prize. The photograph shown in this in memoriam was taken at this occasion.

Romain Coussement turned 65 in the year 2000 and had to retire as prescribed by Belgian law. He was granted the status of professor emeritus at the KULeuven. The journal *Hyperfine Interactions* dedicated an entire volume (*Hyperfine Interactions* 135, 2001), edited by Odeurs, to the scientific career of Romain Coussement at the occasion of his retirement.

His retirement did not mean the end of his scientific activity. He had already published about 180 scientific articles before he retired and 40 more were to come after his retirement. In fact the years 2001 and 2002, just after his retirement, were the most productive years in his entire career as he published 13 articles in each of these years in topics such as nuclear quantum optics and level mixing resonance spectroscopy. His last scientific article was published in 2007 in *Hyperfine Interactions* on “Gamma holography from multiple scattering”, with Romain Coussement as sole author.

Unfortunately nature put more and more limits on the scientific activities of Romain Coussement. His health started to deteriorate and these last years he suffered several strokes, until he passed away mid 2012.

Romain Coussement definitely left his marks in science. He was fond of research and was at his best in scientific discussions. He enjoyed asking “why” when one put

a scientific argument forward. Whenever one approached him with a proposal for an experiment he asked in what respect this experiment would shift the borders of the present scientific knowledge in this field of science. He abhorred from experiments that would just add another data point somewhere in a table without offering new insights.

Romain Coussement could encourage and motivate young people to engage in scientific research. He was also a very social person, loved to engage in discussions with scientists at international conferences, including the two major conferences that he and his colleagues organized in Leuven, the International Conference on the Applications of the Mössbauer Effect in 1985 and the International Conference on Hyperfine Interactions in 1995. He made many friends worldwide.

He will be missed.