

## Professor Indrek Martinson: A Biographical Sketch

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Indrek Martinson was born on 26 December 1937 in Tartu, Estonia. This country had belonged to Russia and became independent in February 1918. However, as a result of the infamous Molotov-Ribbentrop Pact between Soviet Union and Nazi-Germany, Estonia was given over to the Soviet zone of interest. Already in June 1940 Estonia was occupied by Soviet Union and became part of this union. Following the war between the Soviet Union and Germany, Estonia was occupied by German troops and belonged to Germany (Ostland) until September 1944 when the Soviet Union took over again.

With this new occupation many Estonians then fled to the West, and Indrek, together with his parents and sister, also left Estonia as refugees in Germany. At that time World War II was still raging, and Germany was under heavy air raid bombardment. During one air raid the Martinson family had a narrow escape. A German soldier warned them that the bomb shelter nearest them was unsafe, and advised them to hurry across town to another more securely protected shelter. This was good advice, as the nearer shelter was totally destroyed in the bombing.

In September 1946, after two years in Germany, the Martinson family was permitted to come to Sweden. Indrek subsequently obtained Swedish citizenship and (with the exception of research leaves abroad) has lived in Sweden ever since. He has spent numerous years in the US, and a number of shorter stays in many other countries such as Estonia, Lithuania, Japan, Germany, UK etc.

Indrek's parents both had academic degrees from the University of Tartu, his mother in Law and his father in Economics. However, when they first came to Sweden they did not yet know the language, hence it was impossible for them to obtain jobs in their own fields. Initially Indrek's mother obtained a job in a bank and his father worked in a factory. The times were uncertain, and their parents encouraged Indrek and his sister to pursue an education that would be useful regardless of where they would eventually live. Like so many who survived this era, they learned that "The only thing that cannot be taken from you is what is inside your head."

Indrek graduated from the Brännkyrka gymnasium in a southern suburb in Stockholm in May 1957. His favorite subject was then history, and he had little initial interest for physics. However, he then attended Stockholm University where he studied English, Mathematics, Physics, Astronomy and Pedagogy. His ambition then was to become a high school teacher in mathematics and physics, and thus follow in the footsteps of his uncle William Muld (1914–84). After graduating in June 1961 he worked for three months as a high-school teacher in Östra Real, a very good gymnasium in Stockholm. He discovered that his students were brilliant, and this experience convinced him to return to the University to study more physics. He attended lectures in molecular spectroscopy, infrared spectroscopy and nuclear physics, and was offered a temporary position as research assistant at the Nobel Institute of Physics in Stockholm. He then received a scholarship to work toward a fil. lic. Degree (about the same as the present PhD in Sweden). There he performed experiments at the Nobel Institute in beta- and gamma-ray spectroscopy. The Nobel Institute was a hotbed of activity in nuclear physics. Until 1964 the director was Manne Siegbahn, who had received the 1925 Physics Nobel Prize for his pioneering work in X-ray spectroscopy. Interestingly, in a 1964 nuclear physics experiment Indrek and two coworkers set a lower limit to the lifetime of the proton that subsequently became a test of weak interaction theories.

It required a significant amount of time for Indrek to obtain the fil. lic. degree. In his thesis, finished in 1967, he had three articles in nuclear spectroscopy published in *Arkiv för Fysik*. He was then also heavily engaged in teaching at the Royal Institute of Technology in Stockholm, as well as teaching evening classes, which slowed the scientific work. His plan then became to apply for a permanent job as lecturer in physics in a high school in Stockholm. However, while he was considering the submission of this application, a career-defining moment occurred. In December 1967, Professor Ingmar Bergström (Manne Siegbahn's successor as Director of the Nobel Institute) contacted Indrek and asked "Would you like to spend a year in Tucson, Arizona?"

Professor Bergström had just returned from an international conference on beam-foil spectroscopy, arranged in Tucson in November 1967 by Stanley Bashkin, a nuclear physicist also active in nuclear astrophysics. Stanley was leading an exciting activity in beam-foil spectroscopy, atomic physics with accelerators. Ingmar had already arranged things very well. William S. Bickel, as a young man of great promise, came from Tucson to Stockholm. Under the direction of Bill Bickel, a beam-foil program was started in Stockholm, using an 80kV isotope separator. One of the advantages of this machine was that it had a universal ion source, which meant that many elements could be accelerated and studied. Bill, Ingmar, Indrek and the research engineers Lennart Lundin and Rudolf Buchta tried several experiments during April and May 1968, of which the most interesting one was the discovery of doubly excited states in neutral lithium, Li I. In the fall of 1968 they also measured lifetimes for Be, B and C, and this work also went quite well, because all such ions could be obtained from the isotope separator. In those times these atoms and ions were of considerable astrophysical interest, as were their abundances in solar spectra. The lifetimes for transitions observed in the solar photosphere were thus crucial for the abundance determination.

Indrek arrived in Tucson in October 1968, and began a close cooperation with Gordon Berry, Richard Schectman, Bill Bickel and Stanley Bashkin. The Tucson 2 MV Van de Graaff accelerator worked reliably and they obtained much data. They concentrated on studies of spectra and transition probabilities. In the spring of 1969, a young German scientist arrived from Berlin, Jürgen Andrä, whose main interest was quantum beats, to study fine- and hyper-fine separations. Tucson was at that time the center for BFS, but competition came soon from Oak Ridge (Ivan Sellin), Caltech (Ward Whaling), Berkeley (Richard Marrus), Lyon (Maurice Dufay, Jean Desesquelles), Aarhus (Torkild Andersen, Gunnar Sörensen), Quebec (Robert Drouin, Emile Knystautas), and other centers. During about 18 months in Tucson, Indrek participated in many experiments using light atoms and ions, studying boron, carbon, oxygen, sulfur, chlorine, etc.

In Tucson there was also a strong research program in astrophysics, both in the Kitt Peak National Observatory and the Steward Observatory. While in Tucson Indrek made contact with the Norwegian astronomer, Professor Oddbjörn Engvold, who suggested several interesting problems where atomic structure and lifetime studies could be beneficial to the astronomers.

Returning to Stockholm in February 1970, this experimental work was vigorously continued. Also, much work was spent on the international conference on beam-foil spectroscopy, to be held in Lysekil, on the Swedish west coast in June 1970. After the Lysekil Conference I myself went to Stockholm to spend a Sabbatical Leave with Indrek, Ingmar Bergström, Jan Bromander, Gordon Berry, Lennart Lundin, Rudolf Buchta, and others. It was a very productive time, and a defining moment in my own professional career. Professor Siegbahn also supported the research with funds he obtained from the Royal Swedish Academy of Sciences.

It was a great pleasure to Indrek that Professor Manne Siegbahn became intrigued by their studies of atomic structure with accelerators. He asked Indrek to inform him of our results every time we found something new and interesting. Thus, at least once each month Indrek met with Professor Siegbahn in his office, where they went over the latest results. Professor Siegbahn also supported the research with funds he obtained from the Royal Swedish Academy of Sciences.

In November of 1971 Indrek defended his doctoral thesis. It consisted of 18 published papers. The first opponent was Reinhold Hallin, and I served as second opponent. The beam-foil activity in Stockholm continued, with many international exchanges in both directions. I continued to visit Stockholm at least once a year, and obtained another leave-of-absence to spend 1976–77 in Stockholm. At that time Ingmar Bergström called me aside to confide that “we may have a problem, albeit a happy one.” He told me that Indrek was a candidate for the Professorship in Lund, and he considered there to be a very high probability that Indrek would receive this post. Indrek was very enthusiastic about the opportunity to come to the world famous center of atomic spectroscopy created by Bengt Edlén and Lennart Minnhagen. When this occurred, Indrek and I both worked with personnel at Lund and in Stockholm to insure that the Beam Foil activity in Stockholm would continue, as well as the Lund activity in high wavelength resolution spectroscopy, and that the Lund effort would be enhanced by the addition of an accelerator-based atomic spectroscopy group. Applying the lessons learned from Ingmar Bergström, Indrek set a high priority on sending graduate students and older collaborators on research leaves to other countries.

As Professor and Director of the Atomic Data Research Group at Lund, Indrek brought about a merger of traditional high wavelength resolution metrology with fast ion beam time-resolved measurements, laser- and tokamak-produced plasma studies, synchrotron radiation measurements, and Fourier transform spectroscopy. He and his coworkers have made pioneering measurements of doubly excited states, developed quantum beat techniques that yield unprecedented accuracies in lifetime and fine-structure measurements, devised ingenious methods for directly observing forbidden transition rates through differential lifetime measurements, and made measurements that have altered accepted elemental abundances of the Sun and stars.

In addition to his own contributions, Indrek has also created an atmosphere of international cooperation through which many individuals and techniques have been brought together. He has taken a leading role in forging links between western scientists and their counterparts in the former Soviet Union, China, and Japan.

In the fall of 1988 Indrek was invited to Soviet Union and he visited his homeland Estonia for the first time in 44 years. The physicists at the University of Tartu had heard about the MAX synchrotron radiation facility in Lund and asked if there were any possibilities for them to visit to do experiments. In early 1989 the first Estonian physicist came to Lund and the collaboration is still ongoing today. Nearly 40 scientists from Tartu have been working at MAX, and the project has yielded about 300 published papers in atomic physics and crystal physics.

These contributions have been recognized in many ways, with the most poignant occurring in 1991. At that time Indrek returned to the city of his birth to receive an Honorary Doctorate from the University of Tartu, in recognition of his many contributions to international cooperation and collaboration. In 2001 he also received the Estonian White Star Order from President Lennart Meri.

In 1980 a similar collaboration was initiated with Lithuanian theoretical physicists, led by Prof. Zenonas Rudzikas. Numerous Lithuanian physicists have spent time in Lund and there have been many joint papers published dealing with calculations of the structure of complex atoms and ions, and the problems studied were often of considerable interest for applications in astrophysics and fusion plasma physics.

In the late 1980's and early 90's the Baltic countries became independent there was very little money for supporting basic research. However, the very generous support from Swedish and – to some extent – other Nordic funding agencies was extremely valuable. Probably because of these joint programs Indrek was in 1998 elected a member of the Estonian and the Lithuanian academies of science.

Indrek's route has been varied, beginning as a refugee in war-torn Europe to become an eminent scientist, distinguished professor, and rising to become chair of the Physics Section of the Royal Swedish Academy of Science. This journey has been greatly aided by the support, encouragement, and companionship of his wife Evi and his daughters Liisa, Tiina and Maria. We congratulate him on the occasion of his retirement, and wish him continued success in his endeavors.

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