DOI: 10.5185/amp.2017/1201
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Researcher of the Year 2017 – A unique blend of strategic vision for advanced research

Dear Readers,

The
Nobel Prizes have been announced for 2017, and everyone knows that there are tremendous efforts in achieving such level of astounding results to even be considered for an award. At the European Advanced Materials Congress, we had the opportunity to hear more about the way the committee works and the background to the Nobel Prize. In consideration of the prizes given, it is in fact over time a combination of research findings and instrumentation developments which has led the way to ground breaking insights.

Each year Advanced Materials Proceedings selects a researcher of the year. For 2017, we have selected Professor Nils Mårtensson from Uppsala University, Sweden. His research is towards the electronic structure of solids, surfaces and adsorbate systems studied by synchrotron radiation based techniques, in particular photoelectron spectroscopy. He has about 350 publications, an H-index of 61 and to date more than 80 invited talks at conferences.

Professor Nils Mårtensson is active at Uppsala University since more than 40 years, and made his PhD with Kai Siegbahn - Nobel Laureate 1981 – as supervisor. The thesis work was in the field of core-level photoelectron spectroscopy covering screening effects in solids, theory for chemical shifts, the origin of surface core level shifts, multielectron effects as well as detailed experimental reference data. The papers in the thesis alone have been cited 2500 times. The postdoc experience from 1981- 1983 includes several experiences, such as with Dr. D.E. Eastman, IBM, Yorktown Heights. At which he entered the field of synchrotron radiation. A major focus was the electronic structure of narrow band systems like lanthanides and actinides (mixed valence phenomena, itinerant vs. localized f states, surface effects on the f electron structure, etc). The synchrotron radiation research continued with stays in Madison, Wisconsin; University of Oregon, Eugene (with Prof. B. Crasemann) and at the Polytechnic Institute of New York (with Prof. R.D. Parks); and at the Institute of Physics and Measurement Technology, Linköping. In addition, he was visiting scientist during several periods at Institut für Festkörperphysik, KFA, Jülich (with Prof. M. Campagna and Dr. J. Fuggle). During this period, he received King Oscar II's Jubilee Award, Uppsala University (1983) and Lindbom award from the Royal Swedish Academy of Sciences (1988).

After returning to Sweden after his postdoc periods, Professor Mårtensson built up a new group with field of studying surfaces, adsorbates and metal overlayers. The group completed unique in-house instrumentation and got heavily involved at MAX-lab, SSRL, Stanford and ALS, Berkeley. This research led to many "firsts" in the field of surface science. The work elucidated how different types of X-ray based spectroscopies can be used to probe the surface chemical bond and processes at surfaces.

Fig. 1. Researcher of the Year award ceremony during European Advanced Materials Congress 2017.

Nils Mårtensson became Professor in 1989. He is member of the Royal Swedish Academy of Sciences (KVA); the Royal Academy of Arts and Science of Uppsala, and the Royal society of Sciences at Uppsala. His experience has also led to Prof Mårtensson to be member of Board of the Swedish Physical Society, 1988-91; member of the Board of the Swedish Physical Society representing the Royal Swedish Academy of Sciences, 2004-2013; member of the Board of the Carl Trygger Foundation for Scientific Research since 2005. He was also vice-chairman of the Committee for Basic Energy Science at the Swedish Energy Agency, 2006-2009. Since 2014 Professor Mårtensson is member of the Nobel Committee for Physics, and now the chairman. It was a great pleasure to take part of his talk about the committee work Nobel Prize during the European Advanced Materials Congress 2017 held August 22-24 in Stockholm when he presented to more than 600 participants from more than 90 countries.

Fig. 2. Professor Nils Mårtensson presenting the history of Nobel Prize during European Advanced Materials Congress 2017.

Not only has Professor Mårtensson an impressive research profile, but also, he has been very active with establishing instruments and infrastructure. Examples include Scienta SES-200 electron spectrometer, several state-of-the-art beamlines at MAX Lab (now MAX IV Laboratory) as well as involvement in the build-up of beamlines at BESSY in Berlin and at Advanced Light Source (ALS) in Berkeley. He was director of the Swedish National Synchrotron Radiation Laboratory MAX-Lab and MAX IV, Lund 1997-2011, i.e. from the first operation of MAX II up to the funding of MAX IV facility, which will be a world-leading synchrotron radiation facility and is the largest individual research investment so far in Sweden.

Together with the Machine Director of MAX-Lab, Prof. Mikael Eriksson, Professor Mårtensson initiated the MAX IV project in 2002. In 2006 a CDR report was presented which was describing a novel type of synchrotron radiation facility with a number of innovative solutions. Following two very positive evaluations of the project, the detailed design started. The project consists of a larger 3 GeV storage ring, a smaller 1.5 GeV storage ring and a Linac for injection and generation of femtosecond X-ray pulses. The MAX IV project has pioneered a new generation of multibend achromat storage rings and the 3 GeV ring has a record-low electron beam emittance of only 0.24 nmrad. This new concept is now implemented at leading synchrotron radiation facilities in the world. MAX IV Laboratory is also unique in the world due to its choice of a Linac injector, which is done as a preparation for a future X-ray Free Electron Laser.

Fig. 3. Nils Mårtensson talking to two young colleagues, Nikolay Vinogradov, left and Konstantin Simonov, at a MAX-Lab summer school in 2011.

Since 2011 he is member of the Steering Group of Myfab which is the Swedish national research infrastructure for micro and nano fabrication. Shortly after this he received in 2012 the Celsius medal in gold which is the most prestigious award of the Royal society of Sciences at Uppsala. In 2013 Nils Mårtensson received the Advanced Grant from European Research Council (ERC) which allows to set up an activity at the BESSY II synchrotron radiation facility at Helmholtz Zentrum Berlin/BESSY II.

Fig. 4. Four Directors of MAX-lab and the MAX IV laboratory. From left Nils Mårtensson (director 1997-2011), Prof Sine Larsen (director 2011-2012), Prof Ingolf Lindau (1991-97) and Prof Prof Chrisptoph Quitmann (director 2012-present).

This will study time resolved and low-dose photoemission using a new type of time-of-flight electron spectrometer which has a very high transmission while maintaining high energy and angular resolution. This spectrometer is characterized by very high transmission while maintaining high energy and angular resolution. The BESSY II facility was chosen since the time structure for the X-rays fits very well to the requirements set by the ARTOF spectrometers. One beamline is focused on Low-Dose Photoemission where radiation sensitive samples can be investigated without sample destruction due to the X-rays.

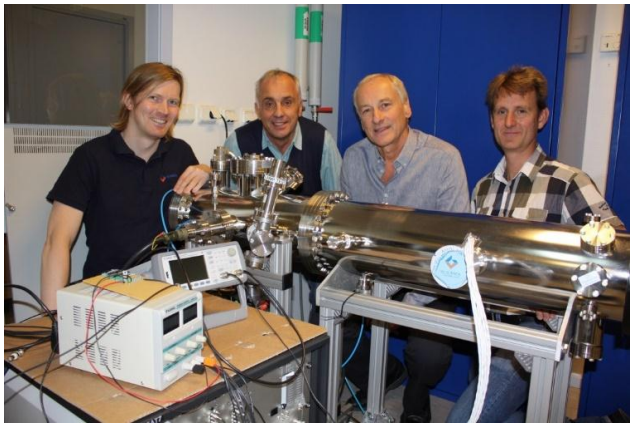

Fig. 5. Part of the team working with the time-of-flight electron spectrometer ARTOF-2. Prof. Svante Svensson and Nils Mårtensson from Uppsala University flanked by Patrik Karlsson (left) and Måns Lundquist from Scienta Omicron.

This is e.g. used to study organic solar cells and similar systems. Another experimental set-up, using two ARTOF spectrometers, will allow electron-electron coincidence measurements. For both systems a MHz laser can be used for pump-probe measurements. Furthermore, one system based on the ARTOF spectrometer has been built-up in Uppsala using a HHG source for fs time-resolved measurements. For this research the Uppsala Berlin joint Laboratory has been established as a collaboration between the Department of Physics and Astronomy in Uppsala and HZB/BESSY II.

Fig. 6. Honorary Doctorate ceremony in Lund 2014.

In 2014 he received the Rudbeck medal from Uppsala University, and also became honorary doctor at Lund University for his research and work with synchrotron instrumentation. His strong experience has led to invitation as evaluator in several international expert committees, e.g in Germany: expert evaluator of the *German Free Electron Laser project, BESSY-FEL* (Wissenschaftsrat - German Science Council) 2005; Expert evaluator for the *German Excellence Initiative in Physics* by the "Deutsche Forschungsgemeinschaft" (DFG), 2006; BESSY Science Advisory Committee 2007-2008 and HZB Science selection panel: Electronic structure 2012-2015.

The Advanced Materials Proceedings is an effort by the International Association of Advanced Material. With more than 60'000 members today, we can only imagine and hope for the innovative research and instrumentations which may lead to novel technologies, Nobel Prizes or any other impact from the work of researchers and their teams. The future will tell!

With kindest regards,

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Editors
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