



## Nobel Laureate series

# Ulf von Euler

**Ulf von Euler received the 1970 Nobel Prize in Physiology or Medicine—jointly with Julius Axelrod and Bernard Katz—for his role in the discovery of neurotransmitters**



Nobel laureate Ulf von Euler grew up against a backdrop of scientific excellence. His father, Hans von Euler-Chelpin, received the Nobel Prize for Chemistry in 1929, jointly with Arthur Harden for their investigations on the fermentation of sugar and fermentative enzymes; his mother, Astrid Cleve, was the daughter of Per Teodor Cleve, who was Professor of Chemistry in Uppsala, Sweden, and discovered the elements thulium and holmium. She later became Professor, devoting her scientific activities to diatoms and geology; and his godfather was Svante Arrhenius, awarded the Nobel Prize for Chemistry in 1903 for his electrolytic theory of dissociation.

From an early age, Ulf was surrounded by stories of relatives who had won the coveted awards and were likely to have been an inspiration for his decision to pursue a career in the sphere of science. It was this environment, and the regular interaction with science and scientists, that nurtured his research interests, which ultimately led to him receiving the 1970 Nobel Prize in Physiology or Medicine, jointly with Bernard Katz and Julius Axelrod for their discoveries concerning 'the humoral transmitters in the nerve terminals and the mechanisms for their storage, release, and inactivation'.

The Nobel committee noted that their discoveries had advanced the understanding of the mechanism underlying the transmission between the nerve cells—the so-called synapses—and between the motor nerve fibres and the muscle fibres which they innervate.

For his part, Professor von Euler had discovered that the substance noradrenaline serves as a neurotransmitter at the nerve terminals of

the sympathetic nervous system. He also demonstrated how this substance is stored in small nerve granules within the nerve fibres of this system. Dr Axelrod's work concerned the mechanisms which regulate the formation of this transmitter in the nerve cells and the mechanisms involved in the inactivation of noradrenaline, whilst Sir Bernard's discoveries focused on the mechanism for the release of the transmitter acetylcholine from the nerve terminals at the nerve–muscle junction.

The laureates, the Nobel committee stated, had presented 'basic data about the physical and chemical mechanisms of the synaptic transmission and thus given us basic information about how the messages are mediated between nerve cells'.

Describing it as 'a fundamental step in neurophysiology and neuropharmacology', the findings unlocked the pathway for advances in the search for remedies against nervous and mental disturbances, yet also represent the background for the development of cardiovascular drugs too.

Indeed, clinical cardiologist Professor Murray Esler, Adjunct Professor of Medicine at Monash University in Australia and a leading expert in the sympathetic nervous system in cardiovascular medicine, said von Euler's discovery was 'an antecedent to demonstration of the importance of the sympathetic nervous system activation as a critical pathophysiology in cardiovascular medicine'.

The three scientists had worked independently of one another, yet together contributed in solving principal questions

concerning the neurotransmitters, their storage, release, and inactivation.

Ulf Svante von Euler was born in Stockholm on 7 February 1905, the second son of Hans and Astrid and entered the Karolinska Institute as a medical student in 1922.

From 1926, he worked as an assistant in Göran Liljestrand's Department of Pharmacology, and in 1930 became Assistant Professor in Pharmacology. Further supported by Liljestrand, von Euler obtained a Rockefeller Fellowship for studies abroad (1930–31) in physiology and pharmacology with Sir Henry Dale in London, Ivan de Burgh Daly in Birmingham, Corneille Heymans in Ghent, and Gustav Embden in Frankfurt.

Later, he learned biophysics with Archibald Vivian Hill in London in 1934, and neuromuscular transmission with G.L. Brown in 1938. From 1946 to 1947, he worked with Eduardo Braun-Menéndez in the Instituto de Biología y Medicina Experimental in Buenos Aires, which was founded by Bernardo Houssay. Professor von Euler had a natural instinct to work with important scientific leaders, proven by the fact that Dale, Heymans, Hill, and Houssay all received the Nobel prize in physiology or medicine.

While in Dale's laboratory, von Euler had discovered an active biological factor in intestinal extracts (Substance P), and on returning to Sweden his interests developed in that direction, leading to the findings of prostaglandin and vesiglandin (1935), piperidine (1942), and noradrenaline (1946). Following the identification of noradrenaline as the adrenergic neurotransmitter, most of von Euler's research work from that point was devoted to this subject.

In 1939, von Euler was appointed Full Professor of Physiology at the Karolinska Institute, where he remained until 1971. His early collaboration with Liljestrand on muscular exercise effects on blood flow had led to the Euler–Liljestrand mechanism—a physiological arterial shunt in response to the decrease in local oxygenation of the lungs.

Ulf von Euler, who was awarded the 1961 Gairdner prize, was a Member of the Nobel Committee for Physiology or Medicine (1953–60), served as Secretary of the Committee (1961–65), and in 1965 was appointed Chairman of the Board of the Nobel Foundation. From 1965 to 1971 he served as Vice-President of the International Union of Physiological Sciences. He was also a member of the Royal Academies of Sciences in Stockholm and in Copenhagen, an Honorary Member of The American College of Physicians, the Council on Clinical Cardiology of the American Heart Association and the Swedish College of Physicians. In 1981, von Euler became a founding member of the World Cultural Council and had been elected a Foreign Member of the Royal Society in 1973.

Between 1930 and 1957, von Euler was married to Jane Sodenstierna (1905–2004) and they had four children: Hans, Johan, Ursula, and Marie. In 1958, he married countess Dagmar Cronstedt.

Ulf von Euler died on 9 March 1983, aged 78.



Co-recipient Bernard Katz was born on 26 March 1911, in Leipzig, Germany, of Russian Jewish origin and studied Medicine at the University of Leipzig (1929–34) before leaving Germany in

February 1935 and accepted as a PhD student with Archibald Hill at University College London. After moving to Australia, he later returned to UCL and was appointed Professor of Biophysics. He died on 20 April 2003, aged 92.



Julius Axelrod was born on 30 May 1912, in New York, the son of basket maker Isadore Axelrod and his wife Molly who were Jewish immigrants from Poland. He received his BSc in biology in 1933 from the City College of New York (CCNY) but having been rejected by the medical schools he applied to, he took a job as a laboratory technician.

From 1955 until his retirement, he worked at the National Institute for Mental Health, where he conducted some of the key research of his career. He died on 29 December 2004, aged 92.

The Karolinska Institute hosts an annual Ulf von Euler Lecture—instigated on his death in 1983 by his former students—and with the intention that it should be given on a subject from a field where he made major contributions or would have taken an interest in.

## Ulf von Euler legacy—Professor Murray Esler



Professor Murray Esler is a clinical cardiologist at the Alfred Hospital, Melbourne, and Adjunct Professor of Medicine, Monash University, Australia. He said: 'Ulf von Euler did research of elemental importance in his homeland, Sweden. In his famous 1946 paper, von Euler demonstrated that the sympathetic neurotransmitter was noradrenaline. Prior to von Euler's discovery the field of sympathetic neurotransmission was

impossibly confused by the nebulous concept that transmission involved the Sympathins I and II'.

Professor Esler, who is the Head of the Human Clinical Neurotransmitters Laboratory in the Baker Heart and Diabetes Institute in Melbourne and continues to study the sympathetic nervous system in cardiovascular medicine, added: 'The research of von Euler—who I met twice—had direct research relevance to me, in that I have spent almost my entire clinical research life measuring the rate of release of noradrenaline (aka 'noradrenaline spillover') to quantify sympathetic nervous activity in human health and disease'.

'von Euler's discovery was an antecedent to demonstration of the importance of the sympathetic nervous system activation as a critical pathophysiology in cardiovascular medicine and underpinned the development of antiadrenergic pharmacotherapy in hypertension and heart failure'.

## Ulf von Euler legacy—Professor Guido Grassi



Professor Guido Grassi, Professor of Internal Medicine at the Clinica Medica of the University of Milano-Bicocca and Director of the Clinica Medica Institute at Saint Gerardo Hospital-Monza/Milano (Italy), described Ulf von Euler, Bernard Katz, and Julius Axelrod as ‘the fathers of modern cardiovascular physiology’.

A former chairman of the ESC Working Group ‘Hypertension and the Heart’, he said: ‘The discoveries performed by von Euler, Katz, and Axelrod also represent the background for the development

of important cardiovascular drugs, such as atropine and the large family of beta-blocking drugs. It can be thus concluded that the research carried out in this area goes well beyond the borders of cardiovascular physiology, involving pathophysiology and pharmacologic treatment of cardiovascular disease’.

**Conflict of interest:** none declared.



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## EHRA 2020 during COVID-19 days

### COVID-19 resulted in confinement instead of a meeting for the European Heart Rhythm Association (EHRA) 2020 Congress

Many of us were looking forward to attending a successful EHRA 2020 Congress in Vienna from 29 to 31 March 2020. Shortly before this was due to take place, the COVID-19 pandemic broke out and changed the course of events worldwide.

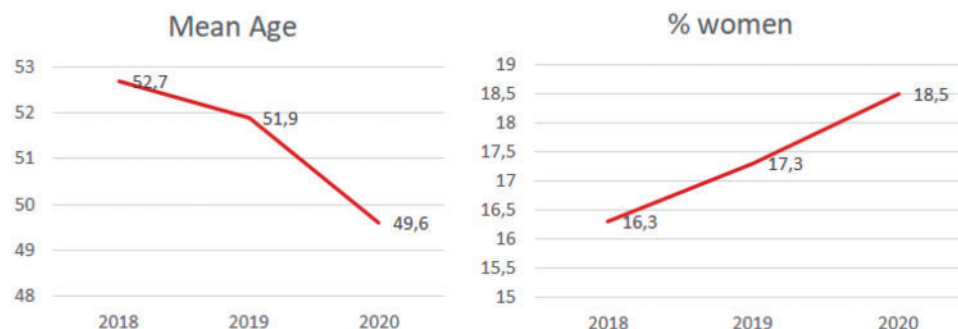
The EHRA Scientific Programme Committee had worked hard to put together a programme with the theme ‘Joining Forces to Overcome Arrhythmias’. This involved identifying hot topics in arrhythmias, while delivering science and education in a variety of formats to make the content enjoyable and address the needs of a wide range of delegates. EHRA is a global community and we ensured that faculty members from all corners of the globe were invited. Whilst acknowledging the value of established colleagues to share their experience and knowledge, we also explicitly opted to provide opportunities to take the stage for younger colleagues. This was reflected in the average age of the faculty, which for the first time fell below 50 years (see *Figure 1*, left panel).

Another objective was to have better representation of female faculty members in the programme (see *Figure 1*, right panel). Adjustment of the gender imbalance will no doubt continue to evolve naturally over the coming years, as more women enter our field.

Attendance at EHRA 2019 in Lisbon had increased by 41% compared with EHRA 2018, which had been negatively impacted by the introduction of restrictive Medtech rules which curtailed sponsoring of attendees. We were extremely pleased with the numbers of registrations for EHRA 2020 which was up by 34% compared with EHRA 2019 for the same period and may even have topped the record number of attendees (6000+) of EHRA 2017 in Vienna! Although COVID-19 was at that time not yet labelled as a pandemic, the EHRA leadership as well as faculty members were increasingly concerned by the health risks for participants.

Furthermore, day after day, it was clear that severe measures must be implemented, and that physicians and hospitals needed to ready themselves to deal with the epidemic. As such, many congress faculties had to cancel their participation in EHRA 2020. As a result of these factors and our responsibility to protect the health of our faculty, delegates, and staff, the EHRA Board decided that cancelling the congress was the only responsible course of action.

Nonetheless, to help the community stay up to date on the latest scientific developments in arrhythmias, we have put together the



**Figure 1** Evolution of the mean age of the faculty (left) and proportion of women faculty members at EHRA congresses over the last 3 years.