

Torbern Bergman Medal 2025 to Pauline Rudd, University College Dublin

Pauline Rudd, Professor at University College Dublin, is the receiver of the Torbern Bergman Medal 2025. The prize ceremony will be held during the 3rd National Meeting of the Swedish Chemical Society, SCS2025, which takes place in Västerås in June 16-18 2025.

What is the topic of your research?

In 1985, I joined the Glycobiology Institute in Oxford, directed by Professor Raymond Dwek. Our aim was to understand the structure and function of sugars attached to IgG. We developed high-resolution methods to separate and identify various glycoforms of glycoproteins, a novel concept in the 1980s. This technology development continues today, focusing on miniaturization and automated data interpretation. We can now analyze both released glycans and glycopeptides, utilising computational tools, such as Graph MS, to combine orthogonal data for the identification and quantification of oligosaccharides with high confidence. Much of our technology has been commercialized in collaboration with Waters Corporation and is used in both basic and applied fields of biochemistry.



Pauline Rudd.
Photo: Private

What are you most proud of when it comes to your work?

(i) I have been very privileged to have learned from some of the best scientists in the world, and to them, I will be forever grateful. Our teams, who have always been so capable, collaborative, and imaginative, have constantly inspired me too. They have filled in the many gaps in my own knowledge and driven the research forward. It's their work that I am presenting at the meeting.

(ii) We have consistently engaged in problem-driven technology development, collaborating with diverse groups worldwide, and this has significantly enhanced our research. Our technology has been applied across various fields, including glycoproteins on the surface of viruses, sugars attached to immunoglobulins, the molecules in the complement pathway, in the interactions between T-cells and Antigen Presenting Cells, and the binding of the Fc regions of particular immunoglobulins to the many different Fc receptors.

(iii) We have also analyzed sugars attached to glycoproteins from species ranging from *Drosophila* to tobacco plants and animal models of disease. At the Irish National Institute for Bioprocessing Research and Training (NIBRT), we developed analytical techniques to ensure the quality of biopharmaceuticals, including erythropoietin and monoclonal antibodies. In the Biotechnology Institute (BTI) A*Star, Singapore, we developed new automated data analysis systems and built miniaturized high-throughput analytical platforms for multi-omics and for QC of lab-grown meat.

(iv) We pioneered the profiling of whole serum to identify changes in glycosylation associated with diseases such as congenital disorders of glycosylation, including galactosemia, for which we developed a clinical

marker, various cancers, infectious and autoimmune diseases. This research revealed useful biomarkers and also allowed us to explore altered pathways that lead to diseases such as breast and prostate cancer by combining data from different -omics platforms.

(v) We created molecular models of the glycoproteins we analyzed, demonstrating the large size, the dynamics, and the heterogeneity of glycans. These data-based models of glycoproteins and their receptors, built precisely to scale and taking into account the dynamics of the sugars, allow us to explore the molecular interactions and identify those that are feasible. We also use these models when we give talks or teach because they reveal something of the elegance and beauty of the molecules and their potential to recognize, bind, and adapt to fit protein binding sites to support life.

How did you decide to work in chemistry?

My uncle was a nuclear physicist, and I briefly considered astrophysics, but when I first stepped into a chemistry lab, I knew it was where my heart would lead me. At 14, I worked with a friend during the holidays to extract rare sugars and sugar phosphates from natural products in the flat over his father's pharmacy, using mostly buckets and washing machines. We had minimal analytical equipment, just a polarimeter and a colorimeter initially. We formed Wessex Biochemicals Ltd., one of the first British biotechnology companies, later acquired by Sigma Chemical Company (St. Louis, USA). This brought our protocols and expertise to a new, larger site in Poole, Dorset which is Sigma's main site in the UK. When my children were born, Sigma built me a lab at home. I was thrilled to join Raymond Dwek's new Glycobiology lab when we moved to Oxford and, after a career break to bring up my four children, I found myself back in the world of sugars.

How would you describe the importance of chemistry to a young person undecided about their studies or career?

I believe you should follow your heart when you choose your career, as in my experience, it is a reliable guide to happiness and a life of service. Often, people tell me that they feel their career chose them! Chemistry offers opportunities to explore many varied fields, from archaeology to patent law, presenting tough intellectual challenges that require both imagination and creativity. Understanding the chemistry that underpins the diversity of sentient life and everything else in the universe is akin to entering an inexhaustible treasure store! As a research scientist, you may not become wealthy, but you can collaborate with people from different nationalities and widely differing cultures, traveling the world and learning along the way. Maybe you can even leave the world a better place than you found it.

As the receiver of the Torbern Bergman Medal, Pauline has been invited to speak at SCS2025 in Västerås in June 16-18 2025. Her presentation is part of the Division of Analytical Chemistry's session on Monday 16 June.

Who should come to listen to your talk at SCS2025?

Everyone is welcome! You do not need to be in the field already, as I will try to speak to the big picture. I plan to share with you the elegance and diversity of the dynamic structures that we study, together with the automated technologies we have developed for separating and analyzing complex mixtures of sugars released from glycoforms. We built these platforms to enable us to explore our particular interest in roles for glycosylation in the immune system and diseases such as cancer, which is associated with significant alterations in glycosylation. I will try to give a perspective on the current and potential outcomes of our basic and applied research programs for human health.

Is there anything in particular that you are looking forward to regarding your trip to Sweden for the SCS2025 conference?

Nowadays, I am more often at medical or biochemistry meetings, so I'm delighted to have the opportunity to hear about research that is at the cutting edge of chemistry. Our research needs always to be underpinned by a secure chemistry base so that the mechanisms we propose to investigate are feasible! I am also planning to take the opportunity of a visit to Sweden to make new friendships and to visit a few colleagues and old friends.

For questions, please contact:

Agnes Rinaldo-Matthis, Head of the Swedish Chemical Society (Svenska Kemisamfundet)
agnes.rinaldo.matthis@kemisamfundet.se

The Torbern Bergman Medal

The Torbern Bergman Medal is awarded during the National Meeting of the Swedish Chemical Society, SCS. It is given to individuals who have made outstanding contributions to analytical chemistry. The medal was established by the Division of Analytical Chemistry in 1967, to commemorate the 200th anniversary of Torbern Bergman's appointment to the professorship of chemistry at Uppsala University and to honor his significant contribution to the development of analytical chemistry in Sweden. The first medalist was Gerold Schwarzenbach, in 1967.

