PRESS RELEASE
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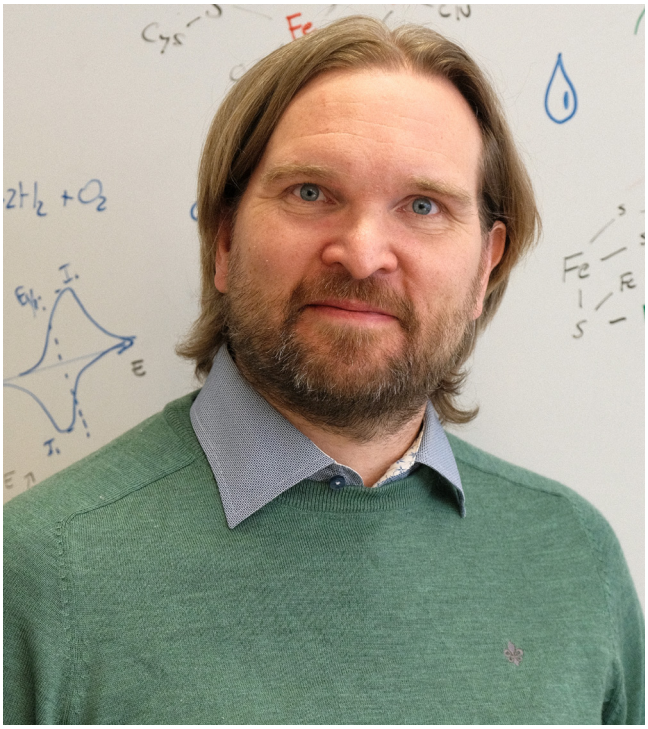
Hugo Theorell Prize in Biophysics 2024 to Gustav Berggren, Uppsala University

The 2024 Hugo Theorell Prize in Biophysics is awarded to Gustav Berggren, Department of Chemistry – Ångström Laboratory, Uppsala University (UU), for his strong commitment to integrating the disciplines of biophysics, biochemistry, and chemistry, into the studies of gas processing metalloenzymes. His innovative multidisciplinary approach has not only expanded our fundamental understanding of these enzymatic systems but is also exploring novel applications in green chemistry and sustainable technology.

Gustav currently holds the position of a full professor at UU. His personal research interests are in the fields of bioinorganic chemistry and biophysics, specializing in hydrogenase biochemistry, biomimetic chemistry and artificial photosynthesis.

Gustav holds a PhD in Chemistry from UU in 2009. He joined UU again in 2015 as an assistant professor.



Gustav Berggren
Photo: Uppsala University

How does it feel to have been awarded the Theorell Prize?
– It's very exciting. Above all, it's very gratifying that the research that we do receives this attention. One should remember that this is not just one person's work – we are an entire team behind the research.

Tell us about your research.
– In my research group, we work with bio-inorganic chemistry. We are interested in the function and chemistry of metals in biological systems. Our focus is primarily on metal enzymes – hydrogenases – which catalyze the uptake and production of hydrogen in various microorganisms.

– Hydrogen metabolism is a very common process among microorganisms. But a particularly exciting example is that hydrogenases help microorganisms survive in extreme places, like Arctic deserts, where there may be no carbon sources and where photosynthesis doesn't work so well. They survive there by extracting hydrogen from the air. Hydrogrenases are extremely efficient and can extract very small trace amounts of hydrogen from the air – from concentrations as low as 500 ppb (parts per billion).

Out of your various achievements, what are you particularly proud of?
– There are a few highlights. For example, we have an article coming out soon where we show that [Fe-Fe]-hydrogenases also exist in archaea. Previously, they had only been found in single-celled eukaryotic cells and bacteria, but now we know that they exist in all parts of the tree of life.

– Inside the cell, there is machinery that helps enzymes mature by introducing cofactors into them. We have been able to mature them with synthetically produced components. I am very proud of this because it makes it much easier to work with these enzymes and allows us to create hydrogenases with desired properties.

What are your goals for this research going forward?
– We want to understand how evolution has developed such extremely efficient catalysts as hydrogenases. In the future, we will look back at variants of the enzymes that have existed further back in time. This may help us to develop new enzymes that are more effective for our needs today. We also want to find out why the enzymes are so incredibly diversified – there are many different variants in different organisms, but several different hydrogenases can also exist within a single organism. We want to know what functions the different types of hydrogenases have.

– On the application side, we are studying intensively how we can use hydrogenases to store energy derived from sunlight. If we want to produce hydrogen through electrolysis or oxidize the gas in fuel cells, we currently use platinum. Evolution, however, chose to use iron in hydrogenases. If we understand more about how they work, we can use them to convert solar energy into hydrogen for energy storage.

What sparked your interest in chemistry and how did you choose your research direction?
– I have loved chemistry ever since I understood what it was. Initially, I wanted to work with molecular design from a pharmaceutical perspective, but over time I became more interested in catalysis and energy research. During a postdoc project in France, I discovered hydrogenases and you could say that it was a ”match made in heaven”. They are very interesting, both from an evolutionarily and from a molecular design perspective. I was particularly drawn to the fact that they have very special and biologically unique cofactors consisting of iron, together with carbon monoxide and cyanide ligands.

Do you have any particular chemist that you look up to?
– There are many, but perhaps especially the three supervisors that I had as a doctoral student and postdoc: Stenbjörn Styring, Mark Fontecave, and Britt-Marie Sjöberg. I feel like as a researcher, I’ve become a blend of all three of them.

More information about Gustav and his research is available here: https://www.kemi.uu.se/angstrom/research/molecular-biomimetics/biophysical-bioinorganic-chemistry/berggren-group

For questions, please contact:
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Hugo Theorell
Hugo Theorell (1903-1982) was one of the pioneers in international biophysical research. Theorell received the Nobel Prize in Physiology or Medicine in 1955 for his ground laying work on oxidizing enzymes.

About the Hugo Theorell Prize
The prize is awarded to a successful young researcher who is active in biophysics in Sweden and has not turned 45 during the year of the award. The Hugo Theorell Prize is a scientific award given in connection with the Swedish Conference on Macromolecular Structure and Function (Sweprot). In addition to a diploma, the award also includes a prize of SEK 5,000. The prize was established in 1991 and is awarded by the Swedish Society for Biochemistry, Biophysics and Molecular Biology (SFBBM).

About SFBBM
The Swedish Society for Biochemistry, Biophysics and Molecular Biology (SFBBM) is an association of Swedish biochemists, biophysicists, and molecular biologists, as well as anybody interested in these sciences. The association’s tasks are to promote the development of biochemistry, biophysics and molecular biology. SFBBM is affiliated with the Swedish Chemical Society. SFBBM is also a member society of FEBS and EBSA. For more information see www.kemisamfundet.se.