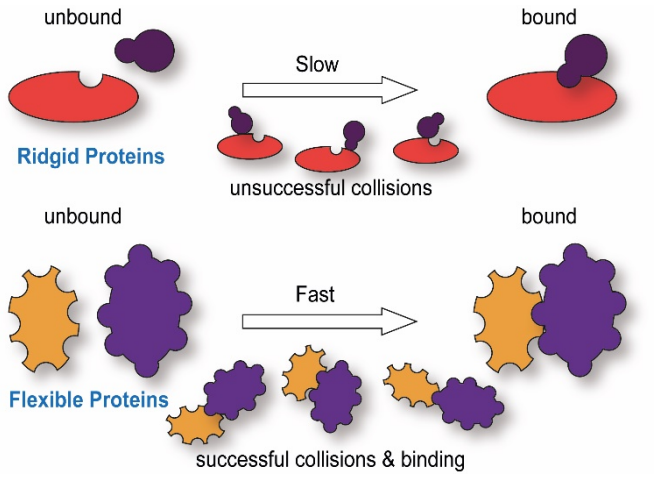
PRESS RELEASE

Shedding light on the dark proteome with IMB's newest Adjunct Director

7th December 2017. *In a joint appointment with Johannes Gutenberg University Mainz (JGU), the Institute of Molecular Biology, Mainz (IMB) is excited to announce the recruitment of Edward Lemke from EMBL, Heidelberg as an Adjunct Director. Professor Lemke will be continuing his groundbreaking work blending chemistry and single molecule biophysics together to unravel the structure and function of intrinsically disordered proteins (the dark proteome).*

One of the first analogies that people learn when studying biology is that the specific interaction of proteins is like a lock and key. The 3D shape of the proteins determines their ability to interact and ensures that only desired interactions occur. But now imagine that your key is flexible and fluid. Not only is deciphering the key's shape impossible but it is hard to picture how such a key could ever be specific enough to be useful. The proteins in our cells are, in fact, often like this. It is estimated that up to 50% of the human proteome is comprised of proteins whose structures are fluid and unfolded in their native state. These proteins, known as intrinsically disordered proteins (IDPs), make up the "dark proteome", as their level of molecular disorder has meant their structure cannot be elucidated with conventional techniques. In the absence of a 3D structure, understanding the precise mechanism and function of a protein is simply much more difficult. Understanding these proteins is essential as, despite their flexible nature, their interactions can be very specific and crucial in vital cellular processes like nucleocytoplasmic transport, gene regulation and host pathogen interactions.

It is here, in the dark waters of the cell's interior that Edward Lemke is shining a light, laser light to be specific. Edward has fused his expertise in both chemistry and biophysics to probe the structure and function of these IDPs at the single molecule level. "We develop technologies that permit the manipulation of biomolecules and the custom design of new functionalities into biology using advanced chemical and synthetic biology tools," he says. "Combining these technologies with custom designed single molecule probes and super-resolution instrumentation, we have been illuminating unique properties of IDPs that, for example, permit them to specifically but also rapidly shuttle proteins across the nuclear envelope (see figure)."



Comparison of ridgid and flexible proteins in their binding kinetics. (Top) Proteins with a ridged structure require interactions with binding partners to occur at highly specific sites. Random collisions make such interactions less common and reduce the speed for protein binding. (Bottom) Proteins which, on the other hand, are flexible in their native state can have many more binding sites and these sites are easier to access. This allows them to interact with more binding partners and they do so faster improving, for example, transport across the nuclear envelope.

Following his appointment as Professor at JGU and as Adjunct Director at IMB, Edward's Lab on "Synthetic Biophysics of Protein Disorder" will be bringing their expertise to Mainz in January 2018. Edward, who received an ERC Consolidator Grant in 2015, will continue to work on optimising the fluorescent labelling techniques he uses; establishing high throughput and microfluidic platforms for single molecule and super-resolution imaging; measuring the interactions of IDPs in real time; and focusing on IDPs that function in nuclear transport.

Further details

Further information about Edward's work can be found at https://www.imb.de/research/lemke/research/ or www.lemkelab.com

About the Institute of Molecular Biology gGmbH

The Institute of Molecular Biology gGmbH (IMB) is a centre of excellence in the life sciences that was established in 2011 on the campus of Johannes Gutenberg University Mainz (JGU). Research at IMB concentrates on three cutting-edge areas: epigenetics, developmental biology, and genome stability. The institute is a prime example of a successful collaboration between public authorities and a private foundation. The Boehringer Ingelheim Foundation has dedicated 100 million euros for a period of 10 years to cover the operating costs for research at IMB, while the state of Rhineland-Palatinate provided approximately 50 million euros for the construction of a state-of-the-art building. For more information about IMB, please visit: www.imb.de.

About the Boehringer Ingelheim Foundation

The Boehringer Ingelheim Foundation is an independent, non-profit organisation committed to the promotion of the medical, biological, chemical and pharmaceutical sciences. It was established in 1977 by Hubertus Liebrecht (1931-1991), a member of the shareholder family of the company Boehringer Ingelheim. With the PLUS 3 Perspectives Programme and the Exploration Grants, the foundation supports independent group leaders. It also endows the internationally renowned Heinrich Wieland Prize as well as awards for up-and-coming scientists. In addition, the foundation pledged to donate 100 million euros to finance the scientific running of the IMB at Johannes Gutenberg University Mainz for ten years. In 2013, the Boehringer Ingelheim Foundation donated a further 50 million euros to Johannes Gutenberg University Mainz.

Press contact for further information

Dr Ralf Dahm, Director of Scientific Management
Institute of Molecular Biology gGmbH (IMB), Ackermannweg 4, 55128 Mainz, Germany
Phone: +49 (0) 6131 39 21455, Fax: +49 (0) 6131 39 21421, Email: press@imb.de