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Novel DNA Sequencer for MDC's Systems Biology Will Provide Deeper Insight into Gene Regulation

The Berlin Institute for Medical Systems Biology (BIMSB) of the Max Delbrück Center for Molecular Medicine (MDC) in Berlin, Germany, will be the first academic research institution in Continental Europe to acquire a novel DNA sequencer enabling the sequencing of single DNA molecules in real time. The SMRT (single molecule, real-time) technology is also faster than current high-throughput technologies. The researchers of the BIMSB will use this third-generation sequencing technology, which was launched on the market in April 2011 by Pacific Biosciences, Menlo Park, California, USA, to gain deeper insight into gene regulation. The new sequencer, PacBio RS, will be installed in the BIMSB labs early in September.

To develop the “single molecule real-time” (SMRT) technology, Pacific Biosciences has combined nanotechnology, biochemistry, surface chemistry and optics. The new sequencer determines DNA sequences in real time by visualizing the reaction of a single enzyme with a single DNA molecule. The process does not require DNA amplification before the sequencing reaction and therefore avoids potential bias. The system is able to produce average DNA reads of greater than 1000 bases and accomplishes one experiment in one day instead of one week or longer. The PacBio RS perfectly complements the current scientific applications and capacities of next-generation sequencing technologies of the BIMSB Scientific Genomics Platform led by Wei Chen.

“The outstanding characteristic of SMRT technology is not only that you can watch how DNA is being synthesized, but also that it enables us to quantitatively determine gene regulation, RNA function, epigenetic gene regulation, DNA modification and genome structure. It allows us to look deeper into how genes and regulatory networks function and opens new approaches to personalized medicine,” said Walter Rosenthal, scientific director of the MDC, and Nikolaus Rajewsky, head of the Berlin Institute for Medical Systems Biology (BIMSB) of the MDC.

The BIMSB was launched by the MDC in 2008, supported by start-up funding from the Federal Ministry of Education and Research (BMBF) and the Senate of Berlin. Medical Systems Biology focuses on molecular networks of genes and proteins, their regulation and interaction with each other and their relevance in disease processes. BIMSB works closely with research institutions and networks in Berlin and beyond, in particular with Humboldt-Universität zu Berlin and Charité – Universitätsmedizin Berlin and also with New York University, USA.

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