DOCTORAL CANDIDATE:	Kristian Kinden Lensjø
DEGREE:	Philosophiae doctor
FAKULTY:	Faculty of Mathematics and natural Sciences
INSTITUTE:	Department of Bioscience
AREA OF EXPERTISE:	Neuroscience
SUPERVISORS:	Marianne Fyhn, Gunnar Dick
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DISSERTATION TITLE: *Extracellular matrix molecules in brain plasticity and memory processing*

SUMMARY:

The brain must balance between the ability to learn new skills and form new memories (plasticity), and at the same time preserve learned skills and memories of experiences (stability). Kristian Kinden Lensjø's doctoral thesis describes a new mechanism for the regulation of this and how this affects learning and storage of memories over time.

The balance between plasticity and stability is regulated by several molecules inside the neurons and their connections. Recent findings have also indicate that molecules outside the neurons, in particular a dense network of sugar-coated proteins termed perineuronal nets (PNNs), are important. The PNNs wrap tightly around the connections of a specific type of neuron towards the end of childhood like a stocking, at the same time as plasticity decreases and the stability increases.

Lensjø has investigated how removal of PNNs affects the neurons' function and how this affects learning and recall of memories. The work in the thesis shows that removal of PNNs alters the ability to remember; recall of remote memories is impaired. This likely happens because the PNNs stabilize the activity and connections of a specific type of neuron that regulates all other cells in the same brain area. Hence, the whole network of neurons is affected. Removing the nets changes the state of the neurons to an immature state similar to the juvenile brain.
In addition, the thesis shows that aggrecan, the biggest molecule of the nets, is an essential part of the structure. Removal of aggrecan alone prevents formation of the PNNs and causes a state of persistent plasticity and low stability.

Together, the results show that the PNN acts as a master regulator of brain plasticity and has an important role in memory processing.