DOCTORAL CANDIDATE:	Karina Stensland Hornslien
DEGREE:	Philosophiae Doctor
FACULTY:	Faculty of Mathematics and Natural Sciences
DEPARTMENT:	Department of Biosciences
AREA OF EXPERTISE:	Plant molecular biology
SUPERVISORS:	Prof. Paul E. Grini
	Dr. Katrine N. Bjerkan
	Prof. Kjetill S. Jakobsen
	Prof. Kamran Shalchian-Tabrizi
DATE OF DISPUTATION:	1st of June 2018
DISSERTATION TITLE:	*Role and Regulation of Parent-of-Origin Allelic Expression in Arabidopsis*

The origin of more than 70 % of human's intake of carbohydrates is seed products. Of highly important crops we find amongst others rice, wheat, maize as well as several species within the cabbage family such as cabbage, rapeseed and mustard. Through the work of this doctoral degree, we have performed basic research on seeds in the Rockcress genus which are closely related to the crop species in the cabbage family. Climate changes leads to shrinkage of arable land due to more drought, more erosion, increasing water levels and larger areas that get more exposed to floods, emphasizing the importance to optimize yield per square meter in agriculture. By identifying and investigating factors and mechanisms that define seed development and seed size, we move forward towards understanding how we can optimize cultivation on a limited area.

Crosses between different species often create new species in nature and is a highly prominent tool in agriculture. We have identified important factors that can give greater insight into why some species can successfully be crossed to each other and others cannot. In the work presented here, we furthermore demonstrate that crosses between two specific species yield small and large hybrid seeds in dependence on which of the species are the mother or father. The work has broadened our knowledge about the specific regulation mechanism, termed genomic imprinting, where some genes always are expressed from only one parent in the seed, only the mother or only the father. Imprinting exists both in animals and plants and especially in species where the new generation is supported by a nutritious organ like the placenta in mammals and the endosperm in many plant species.

Imprinting, as a phenomenon, is vital for seed development. One of the leading theories to explain imprinting is that one imagines that a conflict arises between the mother and father to minimize or maximize the nutrient flow to the developing seed. Genes that are expressed only from the mother will minimize seed size so that the mother plant can distribute the nutrition to all her offspring. Genes that are only expressed from the father will, on the other hand, maximize seed growth and nutritional flow to each individual seed to increase the fitness of his offspring in competition with several other fathers.

Finally, we have shown that epigenetics is a key player in defining which genes are on and off from the mother and father in the developing seed. These epigenetic mechanisms may therefore be important to the creation of new species and moreover be essential to ensure sustainable agriculture and to handle the increasing climatic challenges.