



Katedry fyziológie rastlín, genetiky a biochémie PriF UK  
a občianske združenie *NATURA*



Vás pozývajú na 85. prednášku v rámci Kuželových seminárov:

**Prof. Odd-Arne Olsen**

Norwegian University of Life Sciences, Ås &  
Hedmark University College, Hamar, Norway

## **A key step in land plant evolution and function; Genetic control of the development of 3D body plan in higher plants**

ktorá sa uskutoční **9. marca 2012** (piatok) o **14:00**

v miestnosti **CH1-222** Prírodovedeckej fakulty UK

<http://www.naturaaz.org/seminare.html>  
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## Prof. Odd-Arne Olsen

### **Professional Background:**

Associate professor in genetics, University of Oslo (1981-89)

Research Director, Ag. Res. Council of Norway (1989-1991)

Professor of genetics, UMB (1991-2001)

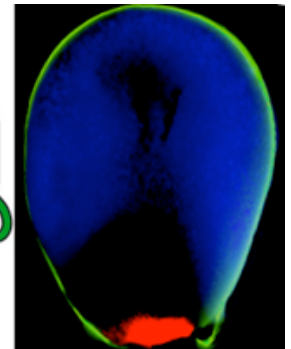
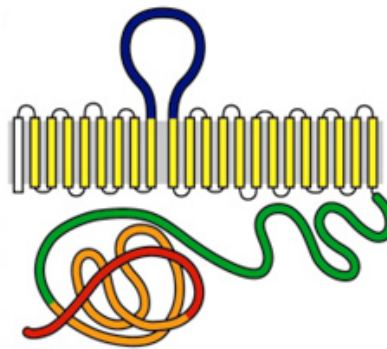
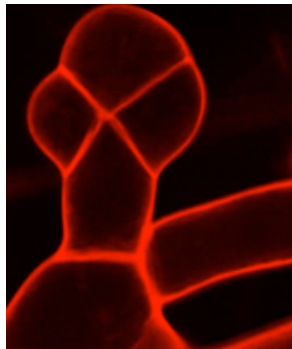
Research Fellow, Pioneer Hi-Bred Int'l, a DuPont company, Johnston, Iowa (2001-2006)

Research Scientist, Monsanto Company in St.Louis (2006-2008). Sabbatical leaves at University of California, Davis, Stanford University, Cornell University.



### **Synopsis of the lecture:**

Land plants evolved during the last billions years or so from single celled green algae, a transition that required the ability to regulate growth in three, rather than two dimensions. Our project focuses on the evolution and function of the



DEK1 protein encoding a membrane anchored calpain proteinase that functions in higher plants to orient and direct three dimensional growth. We trace the origin of *DEK1* to a fusion between genes encoding a membrane protein and a calpain 1.5 billion years ago. Unlike other organisms, plants only have one calpain gene that is highly conserved from *Mesostigma viridis*, a single celled green algae, to *Arabidopsis thaliana*, a modern dicot plant. Our working hypothesis is that DEK1, in interaction with other proteins, enabled the evolution of meristems, and thereby higher plants, by defining the epidermal cell (L1) position. In addition to meristems, DEK1 is essential for epidermal cell development, and thus proper differentiation of embryos, endosperm and leaves. Support for the function of DEK1 in meristems comes from the moss *Physcomitrella patens*, in which a deletion of the *DEK1* gene permits two dimensional growth of protonemal cells, but arrest gametophore development already after the first division of bud apical cell. This project focuses on the evolution of the DEK1 in the plant lineage, including the mechanism for interpreting positional information, mechanisms of DEK1 activation, substrate recognition and processing. A special emphasis will be placed on understanding the evolution of the network of interactors that enabled meristem functionality.

### **Publications relevant to the lecture:**

Lid, S. E., Gruis, D., Jung, R., Lorentzen, J. A., Ananiev, E., Chamberlin, M., Niu, X., Meeley, R., Nichols, S. E., and Olsen, O.-A. (2002). The defective kernel 1 (*dek1*) gene required for aleurone cell development in the endosperm of maize grains encodes a membrane protein of the calpain gene superfamily. *Proc. Natl. Acad. Sci. Proc. Natl. Acad. Sci.* **99**: 5460-5465.

Wang, C., Barry, J.K., Min, Z., Torsden, G., Rao, A.G., Olsen, O.-A. (2003). The calpain domain of the maize DEK1 protein contains the conserved catalytic triad and functions as a cysteine proteinase. *J. Biol. Chem.* **278**: 34467-34474.

Shen, B., Li, C., Min, Z., Meeley, R.B., Tarczynski, M.C., Olsen, O.-A. (2003). Sal1 determines the number of *Proc. Natl. Acad. Sci. USA* **100**: 6552-6557.

Barry JK, Selinger DA, Wang C, Olsen OA, Rao AG. (2005). Biochemical characterization of a truncated penta-EF-hand  $Ca^{2+}$  binding protein from maize. *Biochim. Biophys. Acta* **1764**: 239-245.

Tian, Q., Olsen, L., Sun, B., Lid, S.E., Brown, R.C., Lemmon, B.E., Fosnes, K., Gruis, D., Opsahl-Sorteberg, H.-G., Otegui, M.S., Olsen, O.-A. (2007). Subcellular localization and functional domain studies of *DEFECTIVE KERNEL1* in maize and *Arabidopsis* suggest a model for aleurone cell fate specification involving *CRINKLY4* and *SUPERNUMERARY ALEURONE LAYER1*. *Plant Cell* **19**: 3127-3145.