***CLAVATA* and *RPK2* Signaling Have a Conserved Role in Stem Cell Regulation and Morphogenesis in the Moss *Physcomitrella patens***

Joseph Cammarata1,

Chris Whitewoods2 (If I use one of his RPK2 pictures instead of mine, which I won’t do without permission of course. If I don’t use one of his images, should I include him on the poster nonetheless? )

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C. Jill Harrison3 **Jill, I placed Mike last for the poster because I want to clarify that I’m working with him on this; it’s very clear of course that the author order will be different for the paper. Does this sound OK to you?**

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Plant morphology is constrained by the ability of the cell or cells constituting the apical meristem to orient their cell division planes; plants with apical cells that exhibit one, two, or three-dimensional control of the division plane possess filamentous, planar/branched filamentous, or parenchymatous morphologies, respectively. The gametophyte phase of the moss Physcomitrella patens includes a transition from two-dimensional to three-dimensional growth that is initiated by a series of oblique, asymmetric cell divisions in the bud that produce the a single tetrahedral apical cell. This cell continuously grows and divides to pattern leaf (phyllid) positioning while replenishing itself throughout shoot development, equivalent in function to an angiosperm SAM. The moss SAM thus provides a system for study where the processes of cell growth, cell division, and stem cell homeostasis are tightly coordinated to ensure proper morphogenesis. Previous research discovered a high degree of overlap between the transcriptomes of moss and angiosperm SAMs, suggesting that the equivalent functions fulfilled by these structures are likely regulated by homologous gene regulatory networks. We test this hypothesis by investigating the function of a set of genes upregulated in the moss SAM that are orthologous to *Arabidopsis thaliana* receptor kinases of two clades, the first containing *CLAVATA1* (*CLV1*), *BARELY ANY MERISTEM 1* (*BAM1*), *BAM2*, and *BAM3*; the second containing *RECEPTOR-LIKE PROTEIN KINASE 2* (*RPK2*). We demonstrate that these classical regulators of stem cell maintenance have a conserved role regulating stem cell identity in the Physcomitrella gametophore, as well as a possible novel role in orienting plant cell division planes. Mutants of the moss *CLAVATA1-LIKE1b* gene ­– one of two *CLV1* paralogs in Physcomitrella – display varied but abnormal division planes in buds and form numerous ectopic meristems at the gametophore base that fail to grow normally, indicating a de-repression of meristematic identity there. This phenotype is less severe than that of the rpk2 mutant, where the division plane defects are drastic and shoots abort early on as masses of cells. Importantly, ectopic meristems are sometimes seen on rpk2 shoots, establishing a common theme for the regulatory function of the moss CLL and RPK2 genes parallel to their orthologs in Arabidopsis.