Title: Adaptive evolution of meiosis in Arabidopsis arenosa

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Abstract: Meiosis is essential for fertility of sexual eukaryotes and its core structures and progression are conserved across kingdoms. This system has been fine-tuned by evolution over the eons to separate pairs of homologous chromosomes. Polyploids, however, have more than two copies of every chromosome. In neopolyploids this presents a challenge, with multiple chromosomes often pairing, recombining and forming so-called multivalents that can cause chromosome segregation problems. Multivalents are associated with reduced fertility, and thus it is not suprising that evolved polyploids rarely if ever make multivalents. This shows that polyploids can evolve solutions to the problems they face initially, but how meiotic stability evolves in polyploids has remained largely mysterious. In a genome scan for adaptation to whole genome duplication in *Arabidopsis arenosa*, we previously found evidence that eight interacting meiotic proteins were under strong selection in the polyploid lineage. The proteins encoded by these genes are critical for axis formation, recombination and synapsis, in other words, some of the most central structural processes in meiosis. We hypothesize that modifications of these proteins stabilize polyploid meiosis by directly altering crossover number and/or the strength of crossover interference, with the outcome that there are fewer multivalent associations among the available chromosome copies. Our work provides insights not only into polyploid stabilization, but also more generally how modified recombination rates can evolve and what pleiotropic effects this might have.