Quantifying Pollen Traits to Build a Mathematical Model of Pollen Competition - a Mathematician's Perspective

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In 2016, Swanson et al. showed that when an *Arabidopsis thaliana* stigma is pollinated with equal amounts of pollen by two accessions, Columbia and Landsberg, Columbia pollen sire disproportionately more seeds. This phenomenon is known as nonrandom mating. Previous experiments have investigated nonrandom mating by examining how pollen performance traits such as proportion of pollen germinated, time to germination, and pollen tube growth rates differ between these two accessions. In addition, bioenergetics, such as the energy supplied to pollen tubes from the pistil during fertilization, likely also magnify competition. While plant fertilization is well-studied, the exact mechanics of pollen competition remain unknown. Using an agent-based model, we aim to identify the traits that cause pollen from one accession to sire more offspring than pollen from another accession and to what extent these traits contribute to this process. We calibrate our model against a number of parameters from empirical data to observe the output of seed siring proportions from mixed pollinations; we compare these values to those found in the literature. Our model can also be extended to predict seed siring proportions for other accessions of *Arabidopsis thaliana* given data on their pollen performance traits.