Supporting Information

Sanati Nezhad et al. 10.1073/pnas.1221677110

SI Text

COMSOL File

The COMSOL file for the calculation of the dilating pressure exerted by the pollen tube onto the the microgap wall requires COMSOL Multiphysics 3.5, which may be downloaded from www.webdepot.umontreal.ca/Usagers/geitmana/MonDepotPublic/geitmannlab/documents/Simulation-microgap.mph.

SI Materials and Methods

The lab-on-a-chip was fabricated as detailed in refs. 1 and 2). Briefly, a high-resolution glass mask is fabricated using a DWL 66 machine to ensure minimum roughness at the contact surface between the pollen tube and the polydimethylsiloxane (PDMS) sidewall. The SU-8 mold is fabricated using a photolithographic technique. To reach the thickness of 70 μm, SU-8 2035 is spin-coated on a silicon wafer. The SU-8 is baked for 3 min at 65 °C and for 7 min at 95 °C on a hotplate. After soft-baking, the resist is cooled to room temperature and exposed to UV light with a photo mask for 30 s. Post-baking then is carried out on the resist for 3 min at 65 °C and for 6 min at 95 °C to cross-link the SU-8. The SU-8 layer then is developed to obtain the SU-8 mold. The microfluidic device is fabricated by curing the mix of PDMS and curing agent in a 10:1 ratio on the SU-8 mold and baking at 80 °C for 1 h. This PDMS layer is peeled from the mold and bonded to a glass coverslip using plasma treatment to seal the fluidic network. The inlet and outlets then are connected (Fig. 1*A*).

1. Agudelo C, Packirisamy M, Geitmann A (2013) Lab-on-a-Chip for studying growing pollen tubes. *Plant Cell Morphogenesis: Methods and Protocols,* Methods in Molecular Biology, eds Žárský V, Cvrčková F (Springer, New York).

2. Agudelo C, et al. (2013) TipChip: A modular, MEMS-based platform for experimentation and phenotyping of tip-growing cells. *Plant J* 73(6):1057–1068.

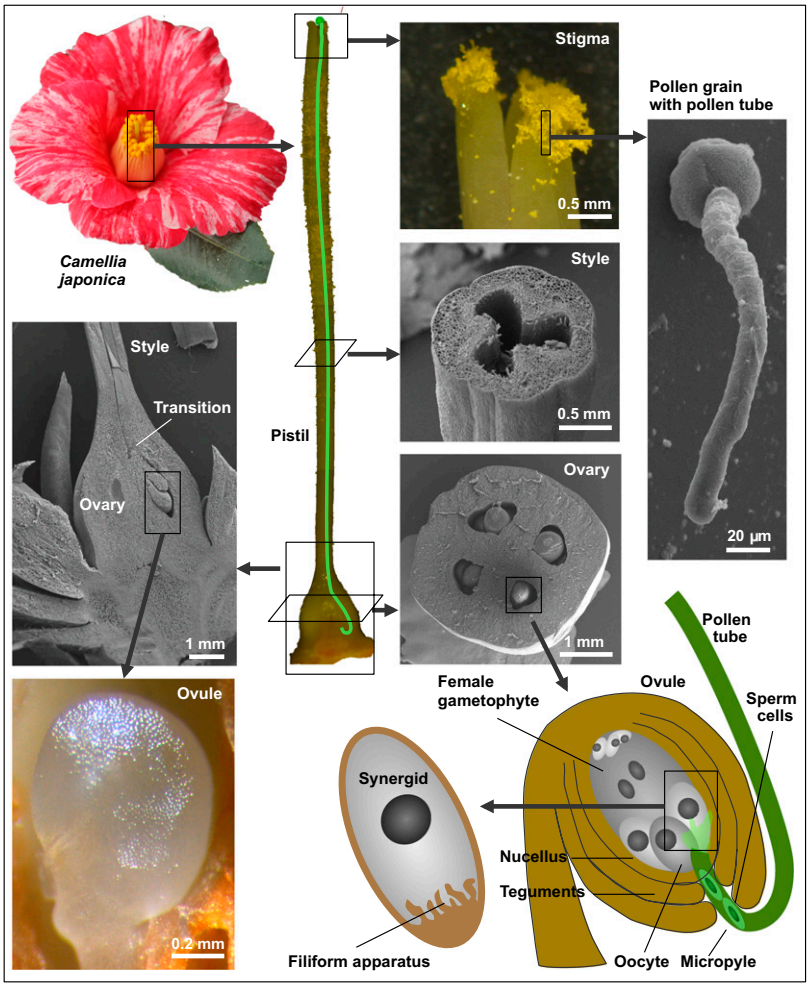


Fig. S1. Pathway of the pollen tube within the *Camellia* pistil. The pistil of the *Camellia* flower has a length of ~30 mm. The pollen grain (green sphere) lands on the stigma, and the tube invades the style to reach the ovary. The style of the *Camellia* pistil is hollow and does not pose a mechanical obstacle. Mechanical impedance to pollen tube elongation is present at the transition region between style and ovary, and at the entrance to the ovule in the form of the micropylar opening, the nucellus, and the filiform apparatus of the synergids. Images were taken by stereomicroscopy of living specimens (color) and scanning electron microscopy of chemically fixed specimens (gray scale).

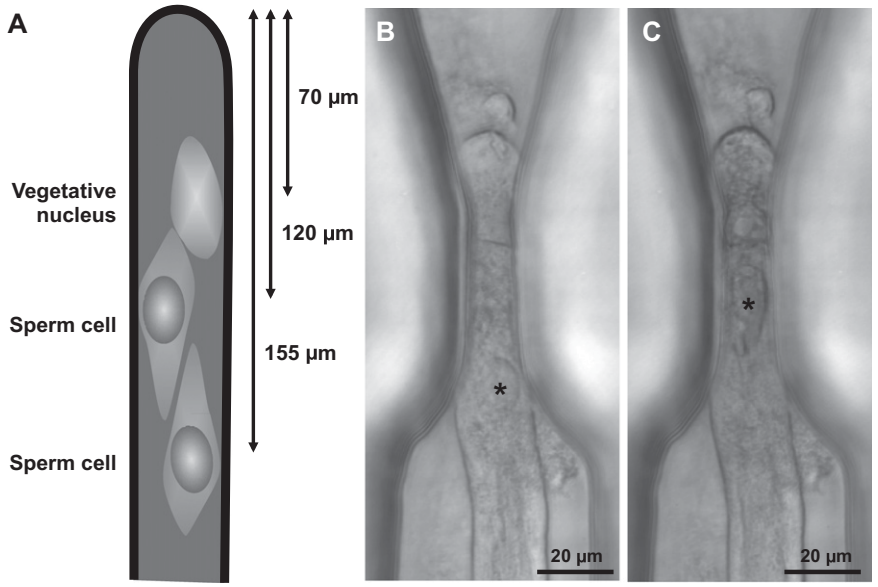
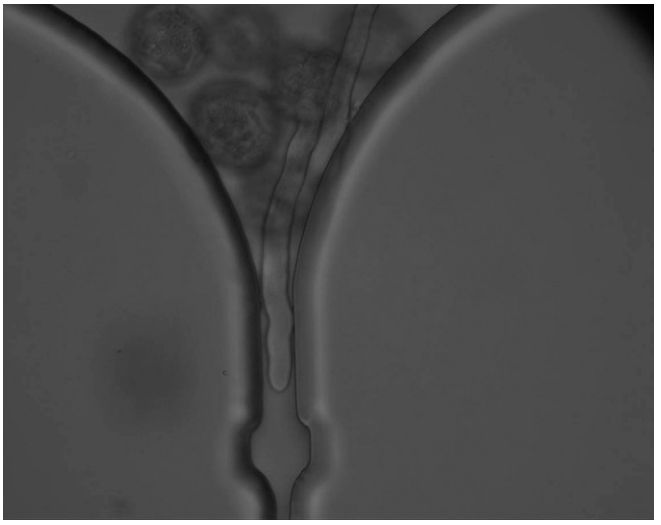
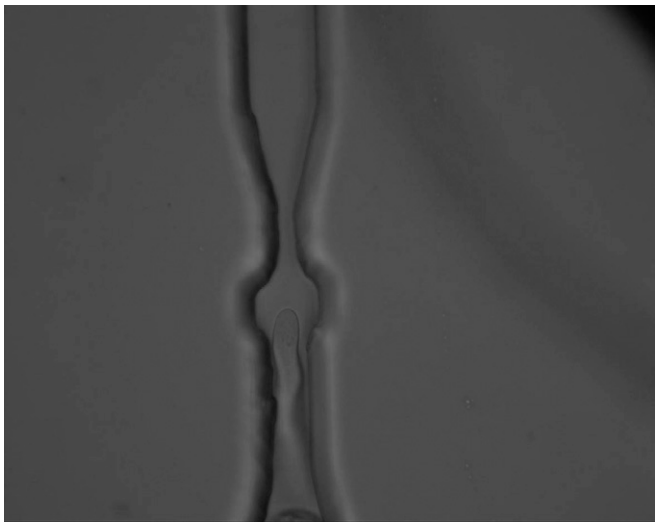


Fig. S2. Passage of the male germ unit through a microgap. (*A*) Schematic representation of the male germ unit consisting of vegetative nucleus and sperm cells with typical distances from the tip of the *Camellia* pollen tube. Objects are not to scale. (*B* and *C*) Bright field micrographs of a pollen tube that burst after passing a microgap. The male germ unit is thrust forward and the vegetative nucleus (*) becomes narrower, but stalls in the gap and is not discharged.



Movie S1. *Camellia* pollen tube growing through a narrow microgap followed by bursting shortly after the tube exits the gap.

Movie S1



Movie S2. *Camellia* pollen tube growing through a microgap sufficiently narrow to impede the male germ unit. The vegetative nucleus (light oval) wiggles to pass the gap and is slowed down during passage. It moves forward rapidly once it passes the gap to attain its normal distance from the tube tip. The sperm cells (elongated) follow closely behind the vegetative nucleus (visible toward the end of the movie).

Movie S2