

## Supplemental information

**Movie 1:** Time lapse video of the growth of single *A. niger* spores on three different cantilevers. Images were recorded using a USB digital camera (AM7013MZT4; Dino-Lite Europe, Netherlands) at 30 minute intervals. Time elapsed ( $t$ ) since the start of the measurement is shown. The labels *A. niger* 1, *A. niger* 2, and *A. niger* 3 correspond to data shown in the main text (Figure 2). Swelling, germination, and propagation of hyphal filaments can be clearly seen. Environmental conditions of 94% RH and 30 °C result in condensation of water on the hydrophilic fungal structure. The cantilevers shown have a length, width, and thickness of 500, 100, and 7  $\mu\text{m}$  respectively.

**Movie 2:** Time lapse video of the growth of a single *A. niger* spore on a cantilever sensor. This video corresponds to data shown in the main text (Figure 3). Images were recorded using a USB digital camera (AM7013MZT4; Dino-Lite Europe, Netherlands) at 30 minute intervals. Time elapsed ( $t$ ) since the start of the measurement is shown. Swelling, germination, and propagation of hyphal filaments can be clearly seen. At 145  $\mu\text{m}$  from the cantilever's free end the hypha splits in two with the resulting hypha having a thickness that is half that of the original. Environmental conditions of 94% RH and 30 °C result in condensation of water on the hydrophilic fungal structure. The cantilever shown has a length, width, and thickness of 500, 100, and 2  $\mu\text{m}$  respectively.

**Movie 3:** Video showing FEM simulation of the vibrational mode shape of the fundamental resonance mode as a hyphal filament propagates along a cantilever's longitudinal axis. The video shown corresponds to data shown in the main text (Figure 5). The hypha is modelled as a rectangular block with a length, width, and thickness of 10, 5, and 5  $\mu\text{m}$  respectively. The length of the hypha is increased in 10  $\mu\text{m}$  intervals. The distance ( $x$ ) between the propagating hyphal tip

and the cantilever's free end is shown. The cantilever has a length, width, and thickness of 500, 100, and 7  $\mu\text{m}$  respectively. The colour legend corresponds to vibrational amplitude (a. u).

**Movie 4:** Video showing FEM simulation of the vibrational mode shape of the second resonance mode as a hyphal filament propagates along a cantilever's longitudinal axis. The video shown corresponds to data shown in the main text (Figure 5). The hypha is modelled as a rectangular block with a length, width, and thickness of 10, 5, and 5  $\mu\text{m}$  respectively. The length of the hypha is increased in 10  $\mu\text{m}$  intervals. The distance ( $x$ ) between the propagating hyphal tip and the cantilever's free end is shown. The cantilever has a length, width, and thickness of 500, 100, and 7  $\mu\text{m}$  respectively. The colour legend corresponds to vibrational amplitude (a. u).

**Movie 5:** Video showing FEM simulation of the vibrational mode shape of the fundamental resonance mode as a hyphal filament propagates along a cantilever's longitudinal axis. The video shown corresponds to data shown in the main text (Figure 6). The hypha is modelled as a rectangular block with a length, width, and thickness of 10, 5, and 5  $\mu\text{m}$  respectively. The length of the hypha is increased in 10  $\mu\text{m}$  intervals. The distance ( $x$ ) between the propagating hyphal tip and the cantilever's free end is shown. 145  $\mu\text{m}$  from the cantilever's free end the width and thickness of the hypha is reduced to 2.5  $\mu\text{m}$ . The cantilever has a length, width, and thickness of 500, 100, and 2  $\mu\text{m}$  respectively. The colour legend corresponds to vibrational amplitude (a. u).

**Movie 6:** Video showing FEM simulation of the vibrational mode shape of the second resonance mode as a hyphal filament propagates along a cantilever's longitudinal axis. The video shown corresponds to data shown in the main text (Figure 6). The hypha is modelled as a rectangular block with a length, width, and thickness of 10, 5, and 5  $\mu\text{m}$  respectively. The length of the hypha is increased in 10  $\mu\text{m}$  intervals. The distance ( $x$ ) between the propagating hyphal tip and

the cantilever's free end is shown. 145  $\mu\text{m}$  from the cantilever's free end the width and thickness of the hypha is reduced to 2.5  $\mu\text{m}$ . The cantilever has a length, width, and thickness of 500, 100, and 2  $\mu\text{m}$  respectively. The colour legend corresponds to vibrational amplitude (a. u).

**Movie 7:** Video showing FEM simulation of the vibrational mode shape of the third resonance mode as a hyphal filament propagates along a cantilever's longitudinal axis. The video shown corresponds to data shown in the main text (Figure 6). The hypha is modelled as a rectangular block with a length, width, and thickness of 10, 5, and 5  $\mu\text{m}$  respectively. The length of the hypha is increased in 10  $\mu\text{m}$  intervals. The distance ( $x$ ) between the propagating hyphal tip and the cantilever's free end is shown. 145  $\mu\text{m}$  from the cantilever's free end the width and thickness of the hypha is reduced to 2.5  $\mu\text{m}$ . The cantilever has a length, width, and thickness of 500, 100, and 2  $\mu\text{m}$  respectively. The colour legend corresponds to vibrational amplitude (a. u). As the hypha propagates along the cantilever's longitudinal axis the vibrational mode shape is seen to change.

**Movie 8:** Video showing FEM simulation of the vibrational mode shape of the fourth resonance mode as a hyphal filament propagates along a cantilever's longitudinal axis. The video shown corresponds to data shown in the main text (Figure 6). The hypha is modelled as a rectangular block with a length, width, and thickness of 10, 5, and 5  $\mu\text{m}$  respectively. The length of the hypha is increased in 10  $\mu\text{m}$  intervals. The distance ( $x$ ) between the propagating hyphal tip and the cantilever's free end is shown. 145  $\mu\text{m}$  from the cantilever's free end the width and thickness of the hypha is reduced to 2.5  $\mu\text{m}$ . The cantilever has a length, width, and thickness of 500, 100, and 2  $\mu\text{m}$  respectively. The colour legend corresponds to vibrational amplitude (a. u). As the hypha propagates along the cantilever's longitudinal axis the vibrational mode shape is seen to change.

**Supplemental Fig 1:** Modelling of hyphal growth along the length of a 7  $\mu\text{m}$  thick cantilever. The hypha has a Young's modulus of 1 GPa. Plots are shown for the fundamental ( $n=1$ ) and second resonance ( $n=2$ ) modes. FEM and the use of equation 2 do not produce the same frequency shifts. This is due to the fact that equation 2 cannot account for the stiffness of an elongated hypha while FEM can.

