Supporting Material for

Switching of swimming modes in *Magnetospirillium gryphiswaldense*

M. Reufer[1], R. Besseling[1], J. Schwarz-Linek[1], V.A. Martinez[1], A.N. Morozov[1], J. Arlt[1],
D. Trubitsyn[2], F.B. Ward[2], W. C. K. Poon[1]

[1] SUPA and COSMIC, School of Physics & Astronomy, The University of Edinburgh, King's Buildings, Edinburgh EH9 3JZ, United Kingdom
[2] Institute of Cell Biology, The University of Edinburgh, King's Buildings, Edinburgh EH9 3JR, United Kingdom
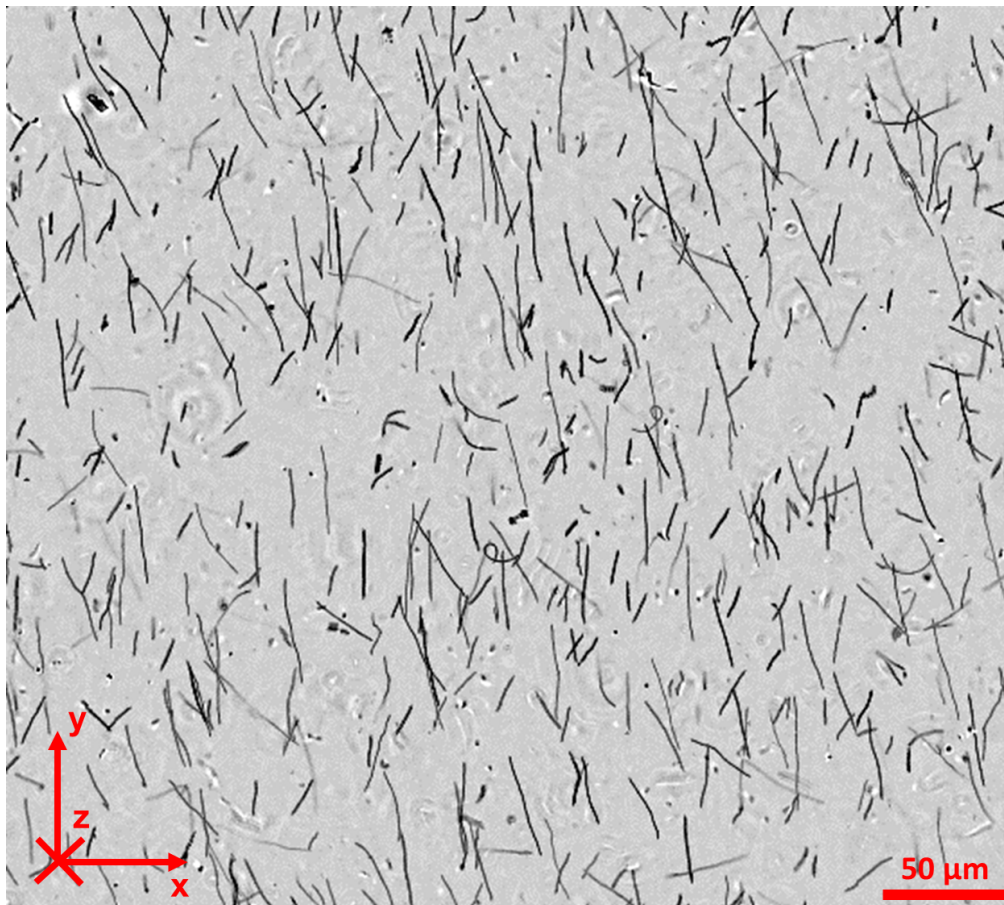
Supporting Figures

Figure S1: Superposition of images recorded during 1 s of M. gryphiswaldense swimming along the bottom of the observation chamber. Each line represents a single cell. The dots are non-motile cells. The horizontal and vertical magnetic field are 1.4 mT and 0.86 mT, respectively.
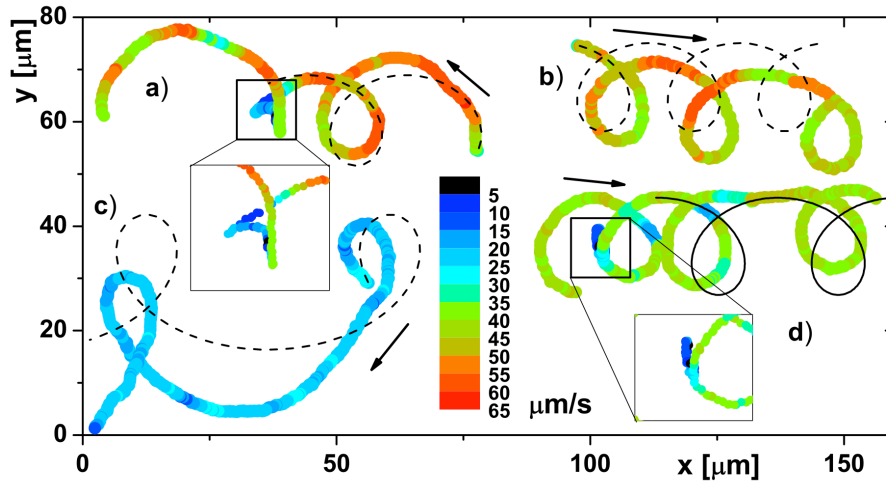
Figure S2: Trajectories of individual cells swimming in the indicated (arrow) direction in a horizontal field of $B_y = -1.5$ mT recorded under conditions summarized in Table S1. The color code corresponds to the absolute swimming speed. The dashed lines show the calculated trajectories with the best-fit parameters summarized in Table S1. Trajectory a) shows a cell swimming SS[fast], then reversing to NS[slow] for a short stretch (see inset) before swimming again SS[fast]. Note, that the averaging over 0.2 s to calculate the absolute swimming speed leads to the impression that the cell slows down before switching to the slower swimming speed. Trajectory b) shows a cell swimming SS[fast]. Trajectory c) shows a cell swimming NS[slow]. Trajectory d) shows a cell swimming SS[fast], then switching briefly to SS[slow] that leads to an almost straight trajectory (see inset), then reversing to NS[slow] to swim back to the first mode switching point and reversing again to continue a looped trajectory in SS[fast] mode. Note that the sense of the curvatures of all the trajectories correspond to what Fig. 3 shows for straight swimmers.

	z position	B_z [mT]	p	ω [1/s]	v [μm/s]
Track a)	bottom	1.4	0.60	-7.1	53
Track b)	top	-1.4	-0.57	6.6	49
Track c)	bottom	-1.8	0.60	3.2	21
Track d)	top	-1.4	-0.65	5.1	40

Table S1: Recording parameters and best fit parameters for tracks shown in Fig. S2