Electronic Supplementary Information for: Self-propelled Worm-like Filaments: Spontaneous Spiral Formation, Structure, and Dynamics

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DESCRIPTION OF THE VIDEOS

The three videos in the ESI show example simulations of a filament with the same bending rigidity $\xi_P/L = 0.2$ from the three different filament regimes: the polymer regimes (S1.mpeg, $Pe = 200$), the weak spiral regime (S2.mpeg, $Pe = 1000$), and the strong spiral regime (S3.mpeg, $Pe = 5000$). The filament is in grayscales with the leading tip colored black. The camera moves with the filament; the red points indicate a spatially fixed reference system as a guidy to the eye.

DETAILS OF THE SIMULATION SETUP

Details of the simulation setup of the free-swimming filaments are summarized in Table I.

$\xi_P/L = \kappa/(k_B T\, L)$	N	$Pe = f_p/(k_B T\, L^2)$	$\Delta t/\tau$	t_e/τ	t_s/τ
100	25	0 – 20000	8.00×10^{-10}	0.0512	5.12
		50000	2.00×10^{-10}	0.0256	2.56
		100000	1.00×10^{-10}	0.0128	1.28
40 – 20	25	0 – 2000	6.40×10^{-9}	0.0512	5.12
		5000	3.20×10^{-9}	0.0512	5.12
		10000	1.60×10^{-9}	0.0512	5.12
		20000	8.00×10^{-10}	0.0512	5.12
		50000	2.00×10^{-10}	0.0256	2.56
		100000	1.00×10^{-10}	0.0128	1.28
10	50	0 – 10000	8.00×10^{-10}	0.0512	5.12
		20000	4.00×10^{-10}	0.0512	5.12
		50000	1.00×10^{-10}	0.0256	2.56
		100000	5.00×10^{-11}	0.0128	1.28
4	50	0 – 100000	8.00×10^{-10}	0.0512	5.12
2 – 0.2	100	0 – 20000	1.00×10^{-10}	0.0512	5.12
		50000	5.00×10^{-11}	0.0256	2.56
		100000	2.50×10^{-11}	0.0128	1.28
0.14 – 0.1	200	0 – 50000	2.50×10^{-11}	0.0128	1.28
		100000	2.50×10^{-11}	0.0064	0.64

TABLE I. Details of the simulation settings. ξ_P/L is the persitence length divided by the filament length, Pe is the *Peclet* number, k_BT is the thermal energy, κ is the bending rigidity of the filament, N is the number of bonds, f_p is the propulsive force per unit length of the polymer, τ is the time that the filament requires to diffuse its own body length, Δt is the timestep of the integrator, t_e is the equilibration time at the beginning of the simulation that is discarded in the analysis, and t_s is the simulation time during which data for the analysis is collected.