## Abstract Submitted for the DFD20 Meeting of The American Physical Society

Slender Phoretic Theory of chemically active filaments<sup>1</sup> PANAYIOTA KATSAMBA<sup>2</sup>, The Cyprus Institute, Nicosia, Cyprus, SEBAS-TIAN MICHELIN, LadHyX, Ecole Polytechnique, Paris, France, THOMAS MONTENEGRO-JOHNSON, School of Mathematics, University of Birmingham, Birmingham, UK — Fuel-based autophoretic microbots drive propulsive slip flows via differential reaction rates of solute fuel at their surface. Typically, they are rigid particles, partially-coated in catalyst (Janus particles), but slender phoretic rods have become an increasingly prevalent design. Hitherto, asymptotic theories for slender phoretic rods have been restricted to straight rods with axisymmetric patterning. However, modern manufacturing methods will soon allow fabrication of slender phoretic filaments with complex three-dimensional shape. Thus, we have developed a fully-3D Slender Phoretic Theory (SPT) for the self-diffusiophoretic filaments of arbitrary 3D shape and patterning that reduces the solute concentration problem to a matter of evaluating a line integral. We demonstrate that, unlike other slender body theories, first-order azimuthal variations arising from curvature and confinement can have a leading order contribution to the swimming kinematics. This slender body theory could be used to rationally design phoretic microswimmers as filaments with complex 3D centrelines and chemical patterning, enabling exciting new dynamics.

<sup>1</sup>EPSRC grant no. EP/R041555/1 (TDM-J PK) ERC grant agreement 714027 (SM).

<sup>2</sup>Research presented was carried out while PK was affiliated with the School of Mathematics, University of Birmingham, UK.

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Date submitted: 10 Aug 2020

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