Supporting Information

. Repulsions and attractions between membrane-deforming spheres, Janus-particles, and opposite tube-like deformations in giant unilamellar vesicles

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Supplementary Video S1: Time-lapse confocal microscopy of a fully membrane-wrapped colloidal particle on a giant unilamellar vesicle (GUV) being repelled from a membrane tube pulled from an optical trap. The curvature-mediated repulsion is observed as the colloids (green) move away from the GUV (magenta).

Supplementary Video S2: Time-lapse confocal microscopy of a partially-wrapped colloidal particle on a giant unilamellar vesicle (GUV) being attracted toward a membrane tube pulled from an optical trap. Colloids are shown in green and the GUV in magenta.

Supplementary Video S3: Time-lapse confocal microscopy showing two adhesive Janus particles on a giant unilamellar vesicle (GUV) aggregating via a strong curvature-mediated attraction.

Supplementary Video S4: Dual optical trap force measurement. The right particle is in a stiff trap while the other, held in a weak trap, acts as a force sensor.
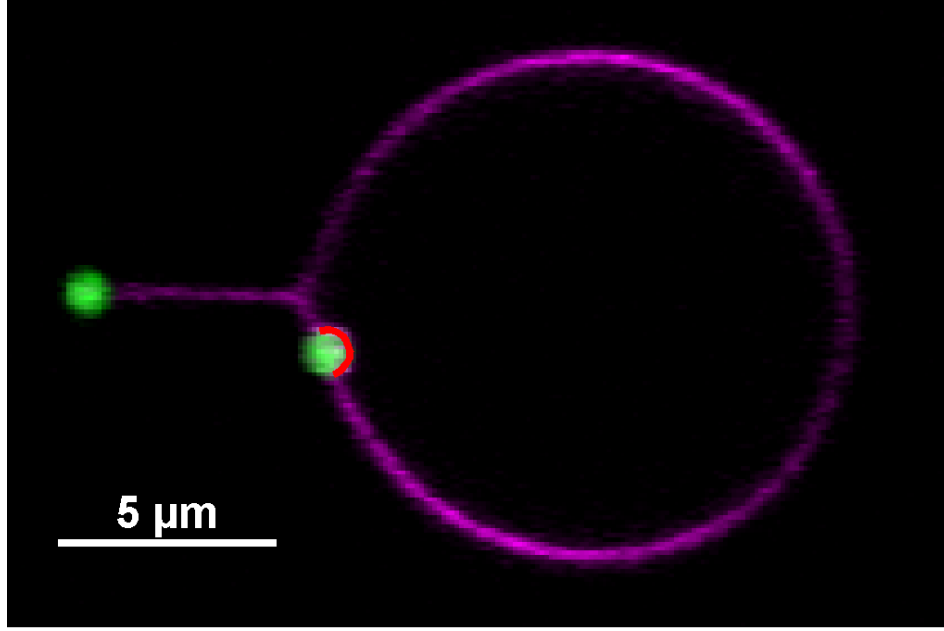
Figure S1: Confocal cross-section of a giant unilamellar vesicle (GUV, magenta) partially wrapping a colloidal particle (green). The contact perimeter (red) is tracked over 20 frames to quantify the wrapping fraction, which in this case is determined to be $(52\pm 1)\%$.
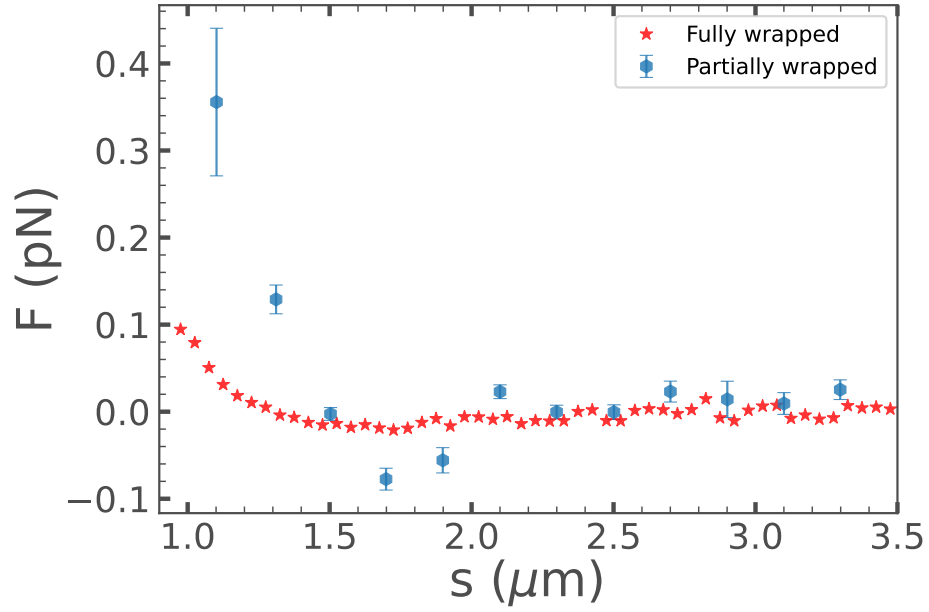

Figure S2: The interaction force $F(s)$ as a function of the geodesic separation distance s between two partially wrapped particles (blue hexagons). For comparison, the force for two fully wrapped particles with the same particle diameter as in our experiments was calculated from the negative derivative of the interaction energy $u(s)$ (i.e., $F(s) = -\frac{du(s)}{ds}$), using data from [1] (red stars).

References

[1] Casper van der Wel, Afshin Vahid, Andela Šarić, Timon Idema, Doris Heinrich, and Daniela J. Kraft. Lipid membrane-mediated attraction between curvature inducing objects. *Scientific Reports*, 6(September):1–10, 2016.