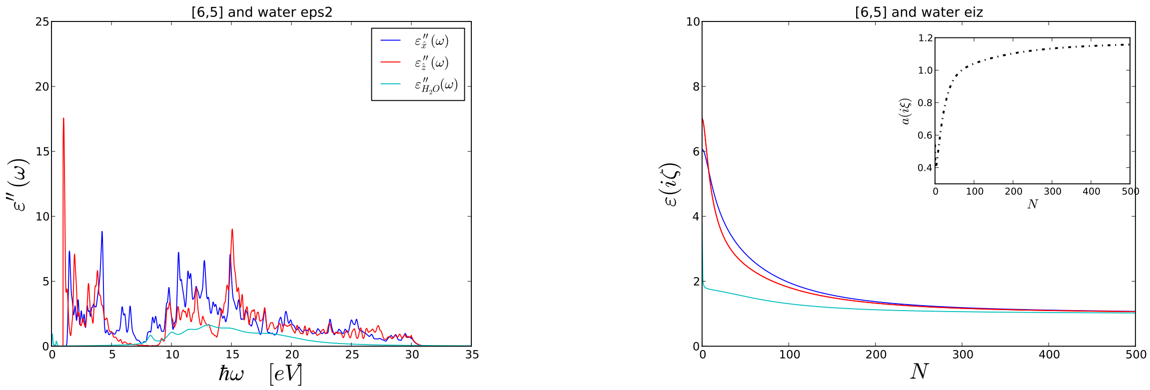
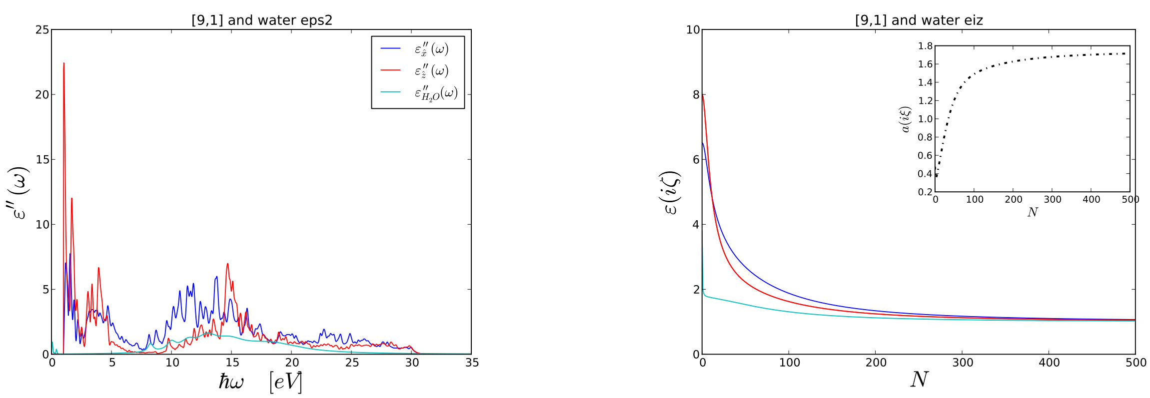


(a) (b)

FIG. 1: Full result using Eqs.**??**,**??** (a) Anisotropic response functions for CG-10 DNA and water. The DNA response functions in the x and y directions were used as perpendicular and parallel inputs, respectively. CG-10 and water eps2 data was provided by Dan Dryden. CG-10 data scales Wai-Yim's calculations by 4.94 and is assumed to include Na (more info in Dan Dryden email sent to us on Nov. 8, 2013). Water data was built from lorentz oscillators R.H.French,J.Amer.Ceram Soc.,83,9,2117-46(2000), H.D.Ackler, et al,J.Coll.Interface Sci.179,46. (b) Anisotropy metric $a_{1,2}(i\zeta_n)$ using Eq.**??**, compares the anisotropy of the cylinders (DNA) to their intervening material, water for the terms contruting to the Matsubara sum.



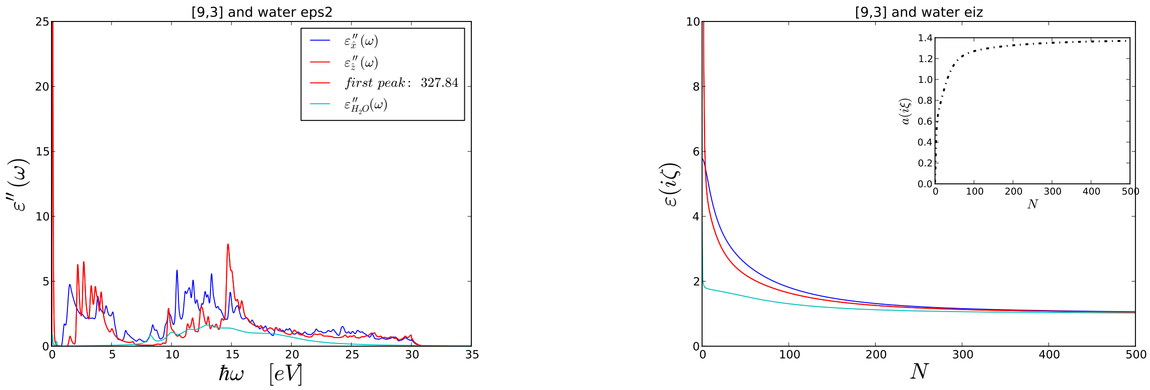
(a) (b)

FIG. 2: Full result using Eqs.**??**,**??** (a) Anisotropic response functions for CG-10 DNA and water. The DNA response functions in the x and y directions were used as perpendicular and parallel inputs, respectively. CG-10 and water eps2 data was provided by Dan Dryden. CG-10 data scales Wai-Yim's calculations by 4.94 and is assumed to include Na (more info in Dan Dryden email sent to us on Nov. 8, 2013). Water data was built from lorentz oscillators R.H.French,J.Amer.Ceram Soc.,83,9,2117-46(2000), H.D.Ackler, et al,J.Coll.Interface Sci.179,46. (b) Anisotropy metric $a_{1,2}(i\zeta_n)$ using Eq.**??**, compares the anisotropy of the cylinders (DNA) to their intervening material, water for the terms contruting to the Matsubara sum.

Tables of Hamaker coefficents results- For comparison of published, Gecko Hamaker, and Python values for perpendicular cylinders in water

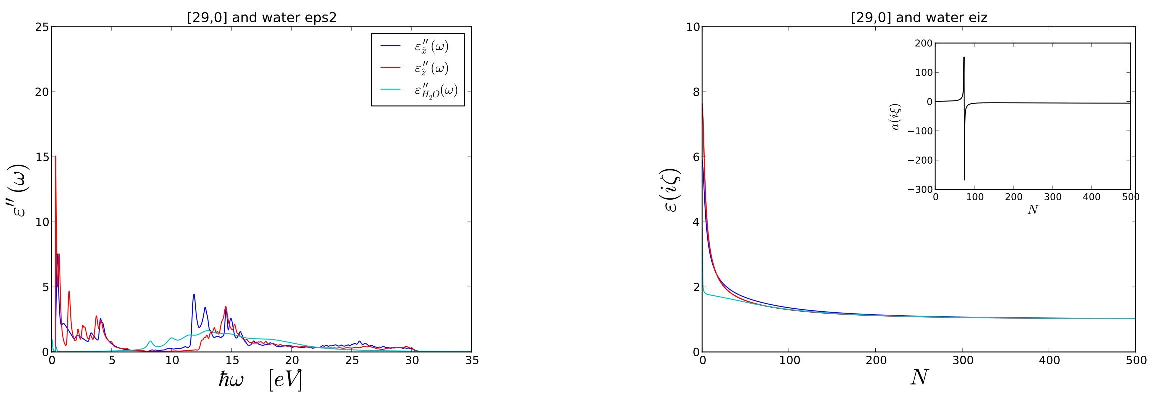
April 2, 2014

Rajter's results were calculated using a water LDS with large peak at n=0, Int. J. Mat. Res 101 (2010). Gecko Hamaker and Python results use Dan's water spectrum.



(a) (b)

FIG. 3: Full result using Eqs.**??**,**??** (a) Anisotropic response functions for CG-10 DNA and water. The DNA response functions in the x and y directions were used as perpendicular and parallel inputs, respectively. CG-10 and water eps2 data was provided by Dan Dryden. CG-10 data scales Wai-Yim's calculations by 4.94 and is assumed to include Na (more info in Dan Dryden email sent to us on Nov. 8, 2013). Water data was built from lorentz oscillators R.H.French,J.Amer.Ceram Soc.,83,9,2117-46(2000), H.D.Ackler, et al,J.Coll.Interface Sci.179,46. (b) Anisotropy metric $a_{1,2}(i\zeta_n)$ using Eq.**??**, compares the anisotropy of the cylinders (DNA) to their intervening material, water for the terms contruting to the Matsubara sum.



(a) (b)

FIG. 4: Full result using Eqs.**??**,**??** (a) Anisotropic response functions for CG-10 DNA and water. The DNA response functions in the x and y directions were used as perpendicular and parallel inputs, respectively. CG-10 and water eps2 data was provided by Dan Dryden. CG-10 data scales Wai-Yim's calculations by 4.94 and is assumed to include Na (more info in Dan Dryden email sent to us on Nov. 8, 2013). Water data was built from lorentz oscillators R.H.French,J.Amer.Ceram Soc.,83,9,2117-46(2000), H.D.Ackler, et al,J.Coll.Interface Sci.179,46. (b) Anisotropy metric $a_{1,2}(i\zeta_n)$ using Eq.**??**, compares the anisotropy of the cylinders (DNA) to their intervening material, water for the terms contruting to the Matsubara sum.

I. RESULTS

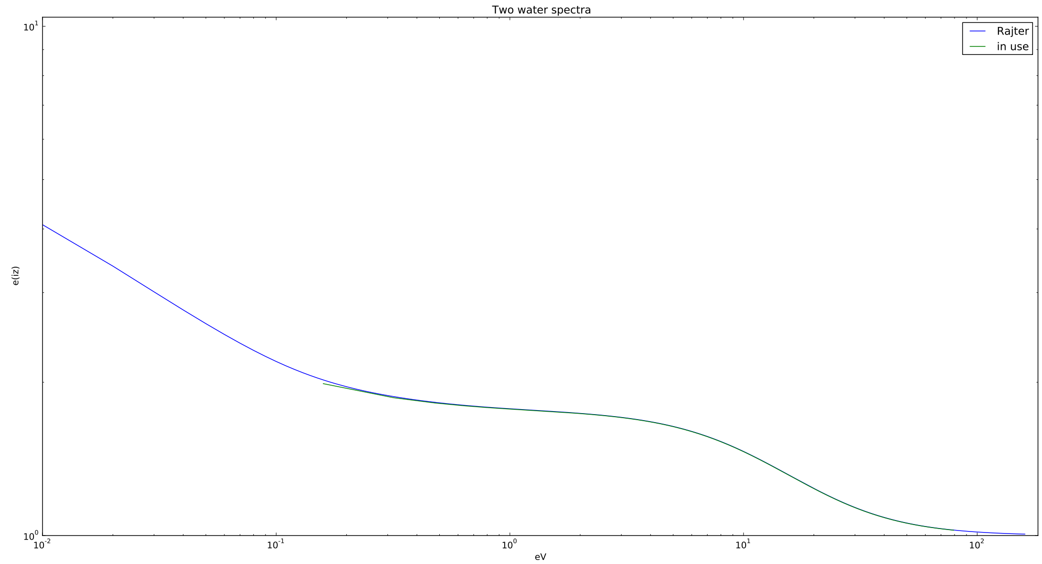
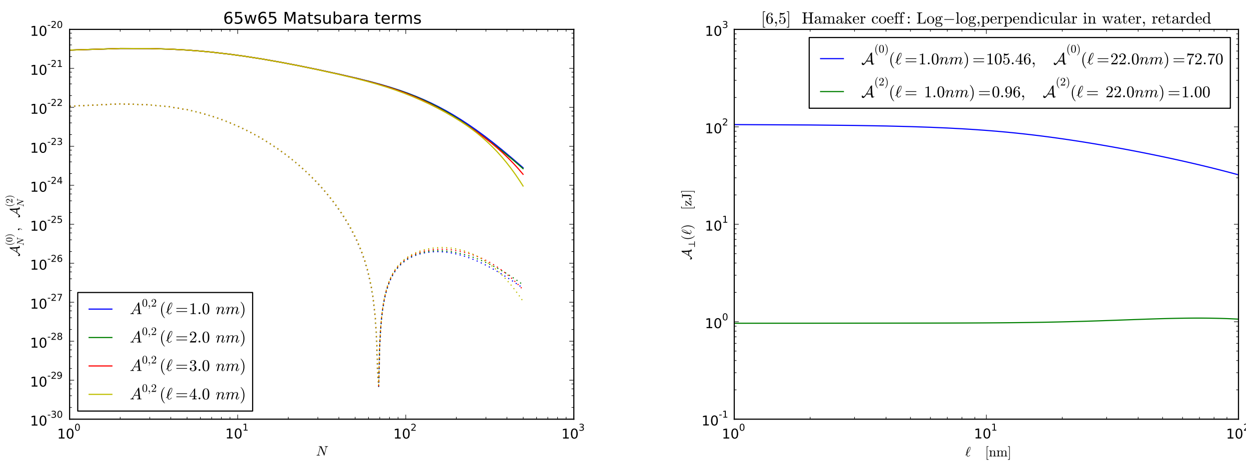
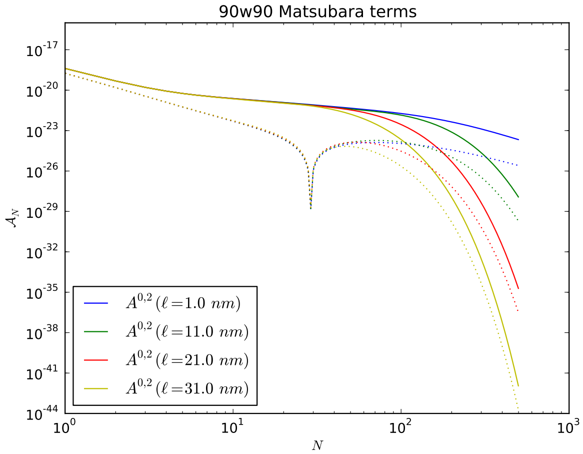


FIG. 5: Loglog plot of $\varepsilon(i\xi)$. Ratjer's spectrum (blue) is a function of continuous energy values and contains a large peak at n= 0. The current spectrum (green) that is used in Python is the K-K transform of eps2 data generated by Dan. Gecko Hamaker also uses Dan's eps2 but may have a different range for its LDS compared to the one plotted in green.

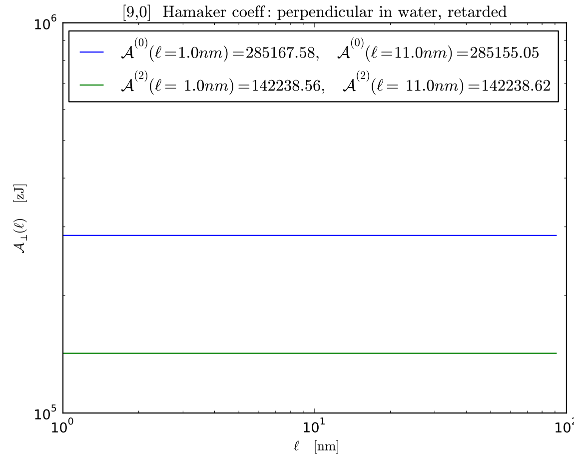


(a) (b)

FIG. 6: Full result using Eqs.**??**,**??** (a) Anisotropic response functions for CG-10 DNA and water. The DNA response functions in the x and y directions were used as perpendicular and parallel inputs, respectively. CG-10 and water eps2 data was provided by Dan Dryden. CG-10 data scales Wai-Yim's calculations by 4.94 and is assumed to include Na (more info in Dan Dryden email sent to us on Nov. 8, 2013). Water data was built from lorentz oscillators R.H.French,J.Amer.Ceram Soc.,83,9,2117-46(2000), H.D.Ackler, et al,J.Coll.Interface Sci.179,46. (b) Anisotropy metric $a_{1,2}(i\zeta_n)$ using Eq.**??**, compares the anisotropy of the cylinders (DNA) to their intervening material, water for the terms contruting to the Matsubara sum.

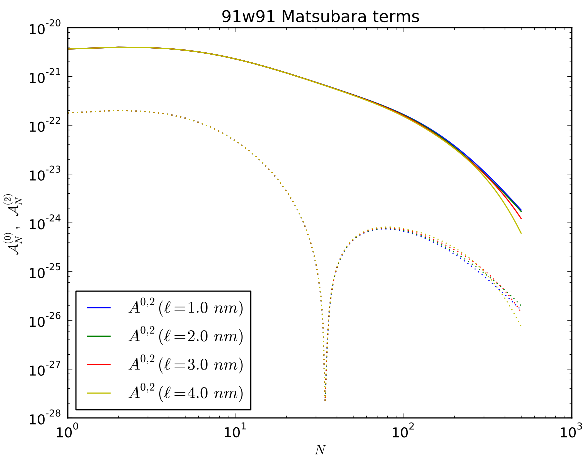


(a)

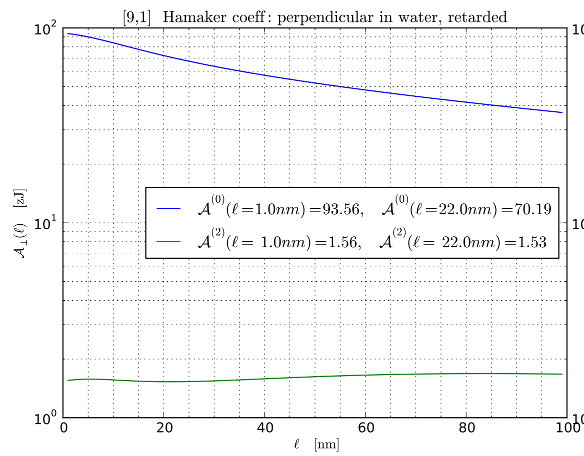


(b)

FIG. 7: Full result using Eqs.**??**,**??** (a) Anisotropic response functions for CG-10 DNA and water. The DNA response functions in the x and y directions were used as perpendicular and parallel inputs, respectively. CG-10 and water eps2 data was provided by Dan Dryden. CG-10 data scales Wai-Yim's calculations by 4.94 and is assumed to include Na (more info in Dan Dryden email sent to us on Nov. 8, 2013). Water data was built from lorentz oscillators R.H.French,J.Amer.Ceram Soc.,83,9,2117-46(2000), H.D.Ackler, et al,J.Coll.Interface Sci.179,46. (b) Anisotropy metric $a_{1,2}(i\zeta_n)$ using Eq.**??**, compares the anisotropy of the cylinders (DNA) to their intervening material, water for the terms contruting to the Matsubara sum.



(a)

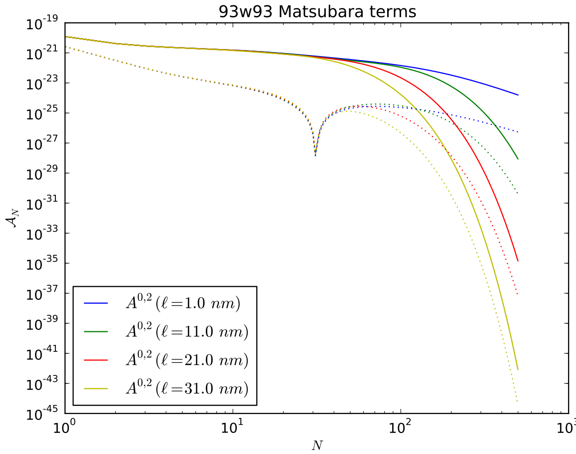


(b)

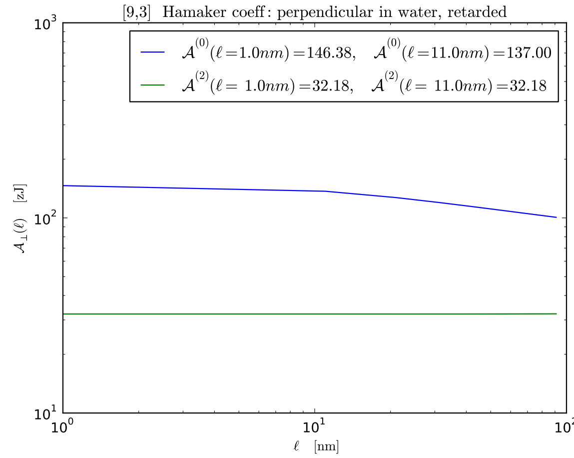
FIG. 8: Full result using Eqs.**??**,**??** (a) Anisotropic response functions for CG-10 DNA and water. The DNA response functions in the x and y directions were used as perpendicular and parallel inputs, respectively. CG-10 and water eps2 data was provided by Dan Dryden. CG-10 data scales Wai-Yim's calculations by 4.94 and is assumed to include Na (more info in Dan Dryden email sent to us on Nov. 8, 2013). Water data was built from lorentz oscillators R.H.French,J.Amer.Ceram Soc.,83,9,2117-46(2000), H.D.Ackler, et al,J.Coll.Interface Sci.179,46. (b) Anisotropy metric $a_{1,2}(i\zeta_n)$ using Eq.**??**, compares the anisotropy of the cylinders (DNA) to their intervening material, water for the terms contruting to the Matsubara sum.

TABLE I: Rajter results from IJMR perpendiuclar cylinders in water (Rajter's spectrum)

CNT	$\mathcal{A}^0$ [zJ]	$\mathcal{A}^2$ [zJ]
[6,5]	106	1.9
[9,0]	-	
[9,1]	92.8	3
[9,3]	107	36.2
[29,0]	18.5	0.8

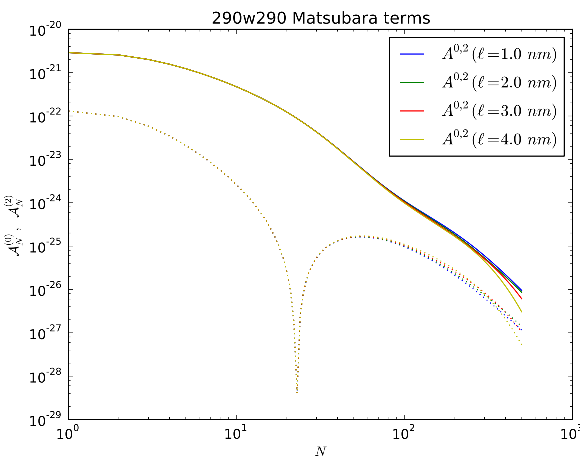


(a)

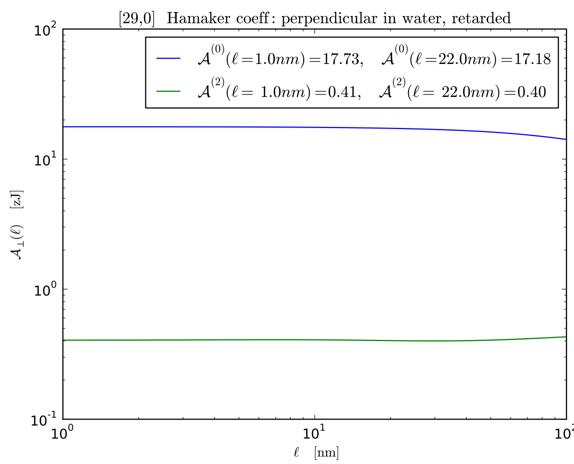


(b)

FIG. 9: Full result using Eqs.**??**,**??** (a) Anisotropic response functions for CG-10 DNA and water. The DNA response functions in the x and y directions were used as perpendicular and parallel inputs, respectively. CG-10 and water eps2 data was provided by Dan Dryden. CG-10 data scales Wai-Yim's calculations by 4.94 and is assumed to include Na (more info in Dan Dryden email sent to us on Nov. 8, 2013). Water data was built from lorentz oscillators R.H.French,J.Amer.Ceram Soc.,83,9,2117-46(2000), H.D.Ackler, et al,J.Coll.Interface Sci.179,46. (b) Anisotropy metric $a_{1,2}(i\zeta_n)$ using Eq.**??**, compares the anisotropy of the cylinders (DNA) to their intervening material, water for the terms contruting to the Matsubara sum.



(a)



(b)

FIG. 10: Full result using Eqs.**??**,**??** (a) Anisotropic response functions for CG-10 DNA and water. The DNA response functions in the x and y directions were used as perpendicular and parallel inputs, respectively. CG-10 and water eps2 data was provided by Dan Dryden. CG-10 data scales Wai-Yim's calculations by 4.94 and is assumed to include Na (more info in Dan Dryden email sent to us on Nov. 8, 2013). Water data was built from lorentz oscillators R.H.French,J.Amer.Ceram Soc.,83,9,2117-46(2000), H.D.Ackler, et al,J.Coll.Interface Sci.179,46. (b) Anisotropy metric $a_{1,2}(i\zeta_n)$ using Eq.**??**, compares the anisotropy of the cylinders (DNA) to their intervening material, water for the terms contruting to the Matsubara sum.

TABLE II: Gecko Hamaker results from 2.07, perpendiuclar cylinders in water

CNT	$\mathcal{A}^0$ [zJ]	$\mathcal{A}^2$ [zJ]
[6,5]	100	1.04
[9,0]	151	6.96
[9,1]	84.85	1.16
[9,3]	80.66	1.55
[29,0]	17.68	0.22

TABLE III: Python results, retarded formulation: perpendiuclar cylinders in water, intersurface distance = 1 nm

CNT	$\mathcal{A}^0$ [zJ]	$\mathcal{A}^2$ [zJ]
[6,5]	105.46	0.96
[9,0]	semi-metal; in progress	
[9,1]	93.56	1.56
[9,0]	semi-metal; in progress	
[29,0]	17.73	0.41

TABLE IV: Python results, non-retarded formulation: perpendiuclar cylinders in water

CNT	$\mathcal{A}^0$ [zJ]	$\mathcal{A}^2$ [zJ]
[6,5]	126.80	1.16
[9,0]	semi-metal; in progress	
[9,1]	112.22	1.87
[9,3]	semi-metal; in progress	
[29,0]	20.93	0.49