```
Needs["ComputerArithmetic`"]
```

In[2]:=
```
(*For extracting the argument of a function*)
finv[_[x__]] := x
```

In[3]:=
```
(*Recursion for generating the solution polynomials*)
g[-1, a_, b_] = (1 / b);
g[0, a_, b_] = 1;
g[n_, a_, b_] := (a + 2 * b) * g[n - 1, a, b] - b^2 * g[n - 2, a, b];
```

In[6]:=
```
(*Onset or SS*)
Y[n_, ntot_, AoL_, Y0_] := g[ntot - n - 1, AoL, 1] * Y0 / g[ntot - 1, AoL, 1]
```

In[7]:=
```
(*Make a piecewise function to fit experimental data*)
YPW[AoL_, mpw_, ntotpw_, Y0pw_] := Piecewise[
  Table[{Simplify[Y[npw, ntotpw, AoL, Y0pw]], mpw - 1 == npw}, {npw, 0, ntotpw - 1}]]
```

In[8]:=
```
(*Only include wings with stereocilium0
 displacements and at least 5 stereocilia*)
Data = Import[
   "/Users/dmelody/Dropbox/Stereocilia/AlexData/PaperData/peak_steady_sd_se
     _fullwings.csv"];
(*Each wing starts at stereocilium 0*)
wingindex = Flatten[Position[Data[[All, 3]], 0]];
(*Number of wings*)
Length[wingindex]
(*Total number of stereocilia*)
Length[Data[[All, 2]]] - 1
```

Out[10]= 38

Out[11]= 302

In[12]:=
```
Data[[1, All]]
Data[[1, 3]]
Data[[1, 4]]
Data[[1, 9]]
```

Out[12]= {wing_id, wing_id2, norm_position_id, peak_nm_y,
 peak_nm_y_n, peak_nm_y_sd, peak_nm_y_se, peak_nm_y_max,
 steady_nm_y, steady_nm_y_n, steady_nm_y_sd, steady_nm_y_se}

Out[13]= norm_position_id

Out[14]= peak_nm_y

Out[15]= steady_nm_y

In[16]:=
```
(*Number of stereocilia with an overshoot excluding stereocilium0*)
Total[Flatten[
  Table[Table[If[Data[[n, 4]] - Data[[n, 9]] > 0, 1, 0], {n, wingindex[[wingindexnum]] + 1,
     If[wingindexnum + 1 > Length[wingindex], Length[Data[[All, 2]]],
      wingindex[[wingindexnum + 1]] - 1]}], {wingindexnum, 1, Length[wingindex]}]]]
(*Total number of stereocilia excluding stereocilium0*)
Length[Data[[All, 2]]] - 1 - Length[wingindex]
(*Fraction of stereocilia with an overshoot*)
N[Total[Flatten[
    Table[Table[If[Data[[n, 4]] - Data[[n, 9]] > 0, 1, 0], {n, wingindex[[wingindexnum]] + 1,
       If[wingindexnum + 1 > Length[wingindex], Length[Data[[All, 2]]],
        wingindex[[wingindexnum + 1]] - 1]}], {wingindexnum, 1, Length[wingindex]}]]] /
  (Length[Data[[All, 2]]] - 1 - Length[wingindex])]
```

Out[16]= 209

Out[17]= 264

Out[18]= 0.791667

In[19]:=
```
(*****************************************************************)
```

In[20]:=
```
(*Exclude wings with a negative onset or steady-
  state because this indicates a damaged wing or a measurement
   artifact. 7 wings have negative onsets or ss. 38-7 = 31*)
Position[Table[Total[Table[If[Data[[n, 4]] < 0 || Data[[n, 9]] < 0, 1, 0],
    {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
      Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}]],
  {wingindexnum, 1, Length[wingindex]}], _?(# > 0 &)]
Length[Position[Table[Total[Table[If[Data[[n, 4]] < 0 || Data[[n, 9]] < 0, 1, 0],
     {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
       Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}]],
   {wingindexnum, 1, Length[wingindex]}], _?(# > 0 &)]]
```

Out[20]= {{2}, {4}, {5}, {12}, {19}, {23}, {38}}

Out[21]= 7

In[22]:=
```
(*7 wings have negative onsets or ss. 38-7 = 31*)
wingindexnum = 2;
{Table[{Data[[n, 3]], Data[[n, 4]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}],
 Table[{Data[[n, 3]], Data[[n, 9]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}]}
wingindexnum = 4;
{Table[{Data[[n, 3]], Data[[n, 4]]},
```

```
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}],
 Table[{Data[[n, 3]], Data[[n, 9]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}]}
wingindexnum = 5;
{Table[{Data[[n, 3]], Data[[n, 4]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}],
 Table[{Data[[n, 3]], Data[[n, 9]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}]}
wingindexnum = 12;
{Table[{Data[[n, 3]], Data[[n, 4]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}],
 Table[{Data[[n, 3]], Data[[n, 9]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}]}
wingindexnum = 19;
{Table[{Data[[n, 3]], Data[[n, 4]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}],
 Table[{Data[[n, 3]], Data[[n, 9]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}]}
wingindexnum = 23;
{Table[{Data[[n, 3]], Data[[n, 4]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}],
 Table[{Data[[n, 3]], Data[[n, 9]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}]}
wingindexnum = 38;
{Table[{Data[[n, 3]], Data[[n, 4]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}],
 Table[{Data[[n, 3]], Data[[n, 9]]},
  {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
    Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}]}
```

Out[23]= {{{0, 369.65}, {1, 148.421}, {2, 91.1}, {3, 58.8714}, {4, 50.3857},
{5, 38.4714}, {6, 19.2714}, {7, 11.7214}, {8, 9.8}, {9, -1.07143}},
{{0, 598.25}, {1, 231.05}, {2, 123}, {3, 63.1}, {4, 43.6},
{5, 31.4}, {6, 19.4}, {7, 7.25}, {8, 7.8}, {9, 13.8}}}

Out[25]= {{{0, 54.2929}, {1, 37.4714},
{2, 13.0643}, {3, 2.4}, {4, -2.47143}, {5, 3.15}, {6, -0.5}},
{{0, 53.55}, {1, 32.1}, {2, 11.05}, {3, -0.2}, {4, 1.3}, {5, 2.45}, {6, 2.1}}}

Out[27]= {{{0, 133.779}, {1, 61.5357}, {2, 50.6}, {3, 25.5143}, {4, 2.78571},
{5, 20.9357}, {6, 9.6}, {7, 28.1071}}, {{0, 117.35}, {1, 44.7},
{2, 29.9}, {3, 11.4}, {4, -1.5}, {5, 14.25}, {6, 8.75}, {7, 11.6}}}

Out[29]= {{{0, 83.3786}, {1, 72.3786}, {2, 38.9786}, {3, 33.4929}, {4, 17.8857},
{5, 10.4857}, {6, 8.28571}, {7, -2.61429}}, {{0, 88}, {1, 75.45},
{2, 34.55}, {3, 19.05}, {4, 12.5}, {5, 2.7}, {6, 0.15}, {7, -2.65}}}

Out[31]= {{{0, 182.717}, {1, 111.667}, {2, 75.2667}, {3, 48.7667}, {4, 22.7167},
{5, 18.65}, {6, 1.76667}, {7, 7.55}, {8, 2.55}, {9, -8.31667}},
{{0, 194.7}, {1, 112.95}, {2, 85.175}, {3, 46.075}, {4, 14.075},
{5, 17}, {6, -0.15}, {7, 5.25}, {8, 1.475}, {9, -10.6}}}

Out[33]= {{{0, 57.8286}, {1, 33.6286}, {2, 22.0143}, {3, 11.5786}, {4, 5.42857},
{5, 7.62143}, {6, 0.0928571}, {7, 1.87857}, {8, 0.1}, {9, 4.72143}},
{{0, 61.8}, {1, 27.75}, {2, 16.15}, {3, 7.5}, {4, 3.5},
{5, -1.1}, {6, 3}, {7, 1.9}, {8, -2.05}, {9, -2}}}

Out[35]= {{{0, 161.15}, {1, 102.229}, {2, 76.45}, {3, 53.9}, {4, 34.0571}, {5, 20.5857},
{6, 13.5286}, {7, 10.1929}, {8, 6.77143}}, {{0, 172.05}, {1, 99.55},
{2, 48.75}, {3, 37.9}, {4, 8.95}, {5, 1.7}, {6, -0.45}, {7, -3.65}, {8, -1.05}}}

In[36]:= (*****************************)

In[37]:=
```
onsetList = Table[NaN, {n, 1, Length[wingindex]}];
onsetnstereoList = Table[NaN, {n, 1, Length[wingindex]}];
onsetAoLList = Table[{{n, NaN}, NaN}, {n, 1, Length[wingindex]}];
onsetAoLPvalList = Table[{n, NaN}, {n, 1, Length[wingindex]}];
onsetY0List = Table[{{n, NaN}, NaN}, {n, 1, Length[wingindex]}];
onsetY0PvalList = Table[{n, NaN}, {n, 1, Length[wingindex]}];
onsetAdjRsqList = Table[{n, NaN}, {n, 1, Length[wingindex]}];
onsetExportTable = Table[{NaN, NaN, NaN, NaN, NaN, NaN}, {n, 1, Length[wingindex]}];
(*Index of analyzed wings*)
analwingindex = 0;
onsetanal = Table[n, {n, 1, 31}];
ssanal = Table[n, {n, 1, 31}];
For[wingindexnum = 1, wingindexnum ≤ Length[wingindex], wingindexnum++,
 onset = Table[{Data[[n, 3]], Data[[n, 4]]},
   {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}];
 ss = Table[{Data[[n, 3]], Data[[n, 9]]},
   {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}];
 If[Length[Select[onset[[All, 2]], # < 0 &]] + Length[Select[ss[[All, 2]], # < 0 &]] > 0,
  Continue[], analwingindex = analwingindex + 1;
  onsetErr = Table[{Data[[n, 3]], Data[[n, 6]] / Sqrt[Data[[n, 5]]]},
    {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
      Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}];
  ssErr = Table[{Data[[n, 3]], Data[[n, 11]] / Sqrt[Data[[n, 10]]]},
    {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
      Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}];
  onsetanal[[analwingindex]] = Join[{analwingindex}, {Table[
      {onset[[n, 1]], Around[onset[[n, 2]], onsetErr[[n, 2]]]}, {n, 1, Length[onset]}]}];
  ssanal[[analwingindex]] = Join[{analwingindex},
    {Table[{ss[[n, 1]], Around[ss[[n, 2]], ssErr[[n, 2]]]}, {n, 1, Length[ss]}]}];]]
```

In[48]:=
```
onsetList = Table[NaN, {n, 1, Length[wingindex]}];
onsetnstereoList = Table[NaN, {n, 1, Length[wingindex]}];
onsetAoLList = Table[{{n, NaN}, NaN}, {n, 1, Length[wingindex]}];
onsetAoLPvalList = Table[{n, NaN}, {n, 1, Length[wingindex]}];
onsetY0List = Table[{{n, NaN}, NaN}, {n, 1, Length[wingindex]}];
onsetY0PvalList = Table[{n, NaN}, {n, 1, Length[wingindex]}];
onsetAdjRsqList = Table[{n, NaN}, {n, 1, Length[wingindex]}];
onsetExportTable = Table[{NaN, NaN, NaN, NaN, NaN, NaN}, {n, 1, Length[wingindex]}];
```

In[55]:=
```
(*Fit wings with all positive onsets and ss*)
(*Index of analyzed wings*)
analwingindex = 0;
```

```
(*Fit weights are 1/SE^2 and there is a
 different number of points in each measurement window*)
For[wingindexnum = 1, wingindexnum ≤ Length[wingindex], wingindexnum++,
 onset = Table[{Data[[n, 3]], Data[[n, 4]]},
   {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}];
 ss = Table[{Data[[n, 3]], Data[[n, 9]]},
   {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}];
 If[Length[Select[onset[[All, 2]], # < 0 &]] + Length[Select[ss[[All, 2]], # < 0 &]] > 0,
  Continue[], analwingindex = analwingindex + 1;
  Print["analwingindex = ", analwingindex];
  Print["wingindexnum = ", wingindexnum];
  onsetErr = Table[{Data[[n, 3]], Data[[n, 6]] / Sqrt[Data[[n, 5]]]},
    {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
      Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}];
  onsetList[[wingindexnum]] = Join[{wingindexnum}, {Table[
      {onset[[n, 1]], Around[onset[[n, 2]], onsetErr[[n, 2]]]}, {n, 1, Length[onset]}]}];
  nstereo = Last[onset[[All, 1]]] + 1;
  fit = NonlinearModelFit[Table[onset[[n, 2]], {n, 1, Length[onset]}],
    {YPW[AoL, m, nstereo, Y0onset]}, {AoL, {Y0onset, onset[[1, 2]]}},
    m, Weights → Table[1 / onsetErr[[n, 2]]^2, {n, 1, Length[onset]}],
    VarianceEstimatorFunction → (1 &)];
  onsetnstereoList[[wingindexnum]] = nstereo;
  onsetAoLList[[wingindexnum, 1, 2]] =
   Evaluate[AoL /. fit["BestFitParameters"][[1]]];
  onsetAoLList[[wingindexnum, 2]] = Evaluate[fit["ParameterErrors"][[1]]];
  onsetAoLPvalList[[wingindexnum, 2]] = Evaluate[fit["ParameterTable"][[1, 1, 2, 5]]];
  onsetY0List[[wingindexnum, 1, 2]] =
   Evaluate[Y0onset /. fit["BestFitParameters"][[2]]];
  onsetY0List[[wingindexnum, 2]] = Evaluate[fit["ParameterErrors"][[2]]];
  onsetY0PvalList[[wingindexnum, 2]] = Evaluate[fit["ParameterTable"][[1, 1, 3, 5]]];
  onsetAdjRsqList[[wingindexnum, 2]] = Evaluate[fit["AdjustedRSquared"]];
  onsetExportTable[[wingindexnum, 1]] = Data[[wingindex[[wingindexnum]], 1]];
  onsetExportTable[[wingindexnum, 2]] = Evaluate[AoL /. fit["BestFitParameters"][[1]]];
  onsetExportTable[[wingindexnum, 3]] = Evaluate[fit["ParameterErrors"][[1]]];
  onsetExportTable[[wingindexnum, 4]] =
   Evaluate[Y0onset /. fit["BestFitParameters"][[2]]];
  onsetExportTable[[wingindexnum, 5]] = Evaluate[fit["ParameterErrors"][[2]]];
  onsetExportTable[[wingindexnum, 6]] = Evaluate[fit["AdjustedRSquared"]];
  Print[Data[[wingindex[[wingindexnum]], 2]]];
  Print[fit["ParameterTable"]];
  Print[
   Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
```

```
    Alignment → Left]];
  (*Tick Marks*)
  TickLength = 0.02;
  Xmin = 0;
  Xmax = nstereo - 1;
  Ymin = 0;
  deltaY = 10^(MantissaExponent[onsetList[[wingindexnum, 2, 1, 2]]["Value"] +
         onsetList[[wingindexnum, 2, 1, 2]]["Uncertainty"]][[2]] - 1);
  Ymax = Ceiling[onsetList[[wingindexnum, 2, 1, 2]]["Value"] +
     onsetList[[wingindexnum, 2, 1, 2]]["Uncertainty"], deltaY];
  Linewidth = 0.005;
  Fontsize = 12;
  XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
  YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, deltaY}];
  Print[Show[ListPlot[onsetList[[wingindexnum, 2]],
     PlotRange → {{-0.5, Xmax + 0.5}, {-deltaY / 2, Ymax + deltaY / 2}},
     PlotStyle → Thickness[Linewidth], IntervalMarkersStyle → Thickness[Linewidth],
     Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
     FrameLabel → {"Stereocilium position", "Peak displacement (nm)"},
     Joined → False, FrameStyle → {{{Black, Thickness[Linewidth],
          FontSize → Fontsize}, {Black, Thickness[Linewidth], FontSize → Fontsize}},
       {{Black, Thickness[Linewidth], FontSize → Fontsize},
        {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
    ListPlot[Table[{onset[[n, 1]], YPW[onsetAoLList[[wingindexnum, 1, 2]],
        n, nstereo, onsetY0List[[wingindexnum, 1, 2]]]},
      {n, 1, Length[onset]}], PlotStyle → Blue, Joined → True]]]]
```

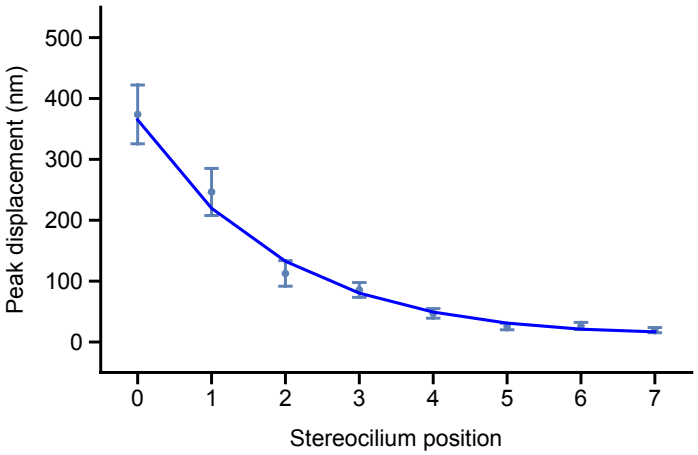
```
analwingindex = 1
```

```
wingindexnum = 1
```

```
S8731025_left_1
```

	Estimate	Standard Error	t-Statistic	P-Value
AoL	0.263558	0.028525	9.23953	0.000090762
Y0onset	364.877	35.9341	10.1541	0.0000530807

```
AdjustedRSquared 0.980438
AIC              64.8256
BIC              65.064
RSquared         0.985328
```



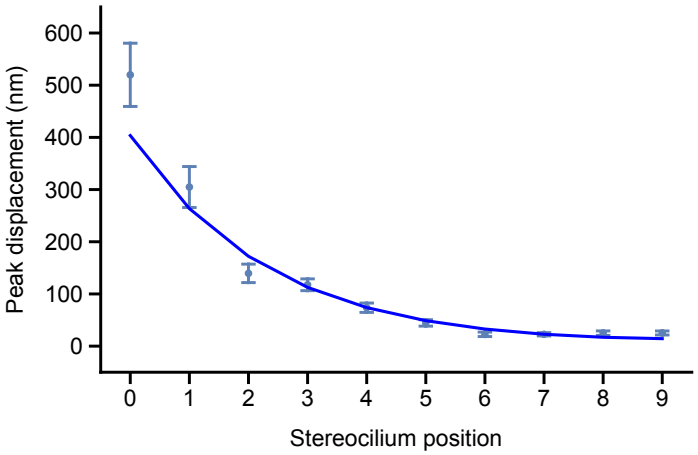
analwingindex = 2

wingindexnum = 3

S8731027_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.184873	0.0151669	12.1892	1.90278	$\times 10^{-6}$
Y0onset	403.539	32.1748	12.5421	1.52994	$\times 10^{-6}$

AdjustedRSquared 0.944559
AIC 95.1203
BIC 96.028
RSquared 0.955647



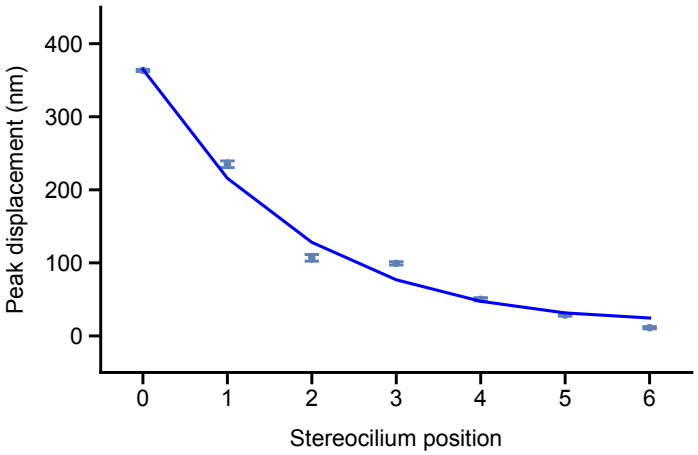
analwingindex = 3

wingindexnum = 6

S8731036_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.284436	0.00507923	55.9998	3.43469	$\times 10^{-8}$
Y0onset	364.917	1.45268	251.202	1.89719	$\times 10^{-11}$

AdjustedRSquared 0.995306
AIC 255.531
BIC 255.369
RSquared 0.996647



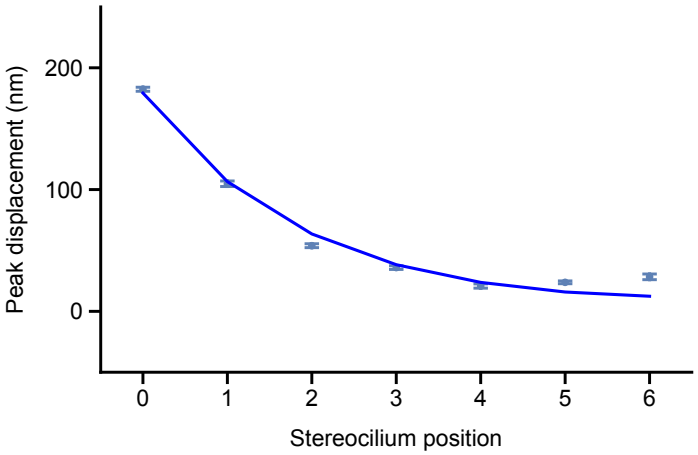
analwingindex = 4

wingindexnum = 7

S8731036_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.279249	0.00767818	36.3691	2.95889	$\times 10^{-7}$
Y0onset	179.263	1.56741	114.368	9.69208	$\times 10^{-10}$

AdjustedRSquared 0.988281
AIC 166.548
BIC 166.386
RSquared 0.991629



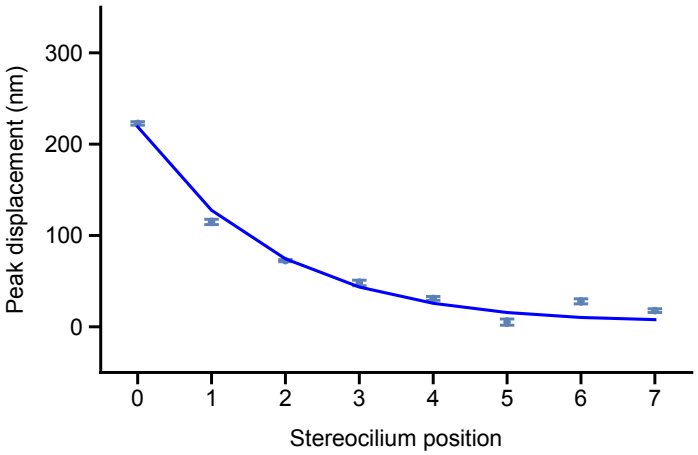
analwingindex = 5

wingindexnum = 8

S8731044_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.299858	0.00846557	35.4208	3.37529	$\times 10^{-8}$
Y0onset	219.025	1.84711	118.577	2.42556	$\times 10^{-11}$

AdjustedRSquared 0.992645
AIC 142.243
BIC 142.481
RSquared 0.994484



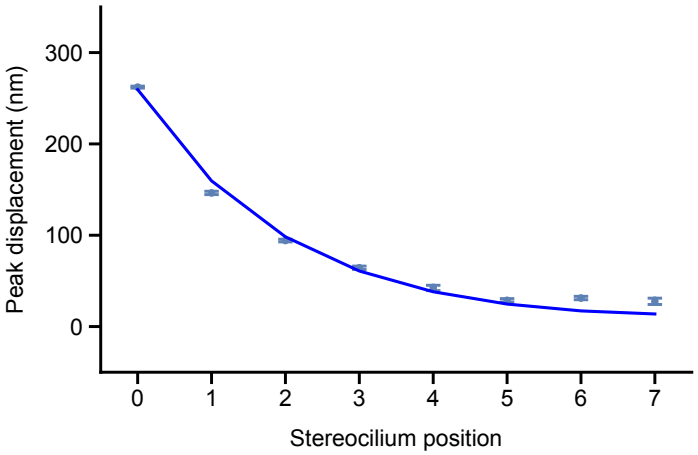
analwingindex = 6

wingindexnum = 9

S8731045_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.242363	0.00496274	48.8367	4.94269	$\times 10^{-9}$
Y0onset	259.479	1.0454	248.21	2.88587	$\times 10^{-13}$

AdjustedRSquared 0.997214
AIC 181.284
BIC 181.523
RSquared 0.99791



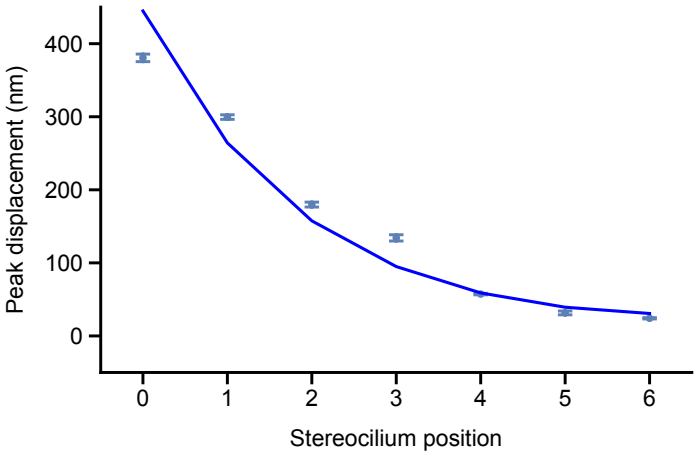
analwingindex = 7

wingindexnum = 10

S8731047_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.279735	0.00391101	71.5251	1.01182	$\times 10^{-8}$
Y0onset	444.78	4.00306	111.11	1.11985	$\times 10^{-9}$

AdjustedRSquared 0.970443
AIC 506.133
BIC 505.97
RSquared 0.978888



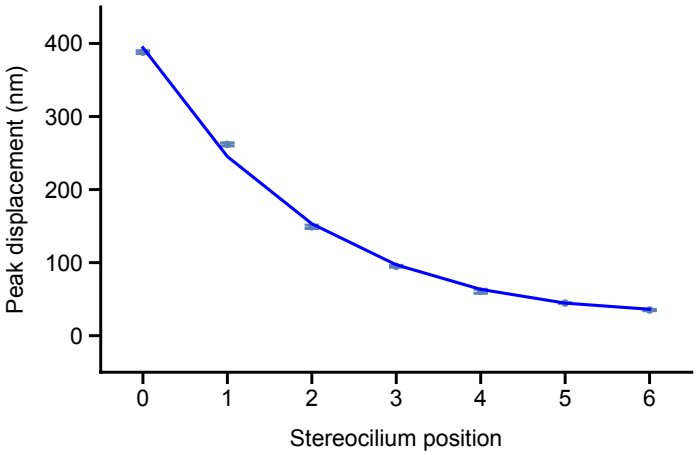
analwingindex = 8

wingindexnum = 11

S8731047_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.233129	0.00195691	119.131	7.90399	$\times 10^{-10}$
Y0onset	394.266	1.78402	220.999	3.59962	$\times 10^{-11}$

AdjustedRSquared 0.998458
AIC 103.039
BIC 102.877
RSquared 0.998899



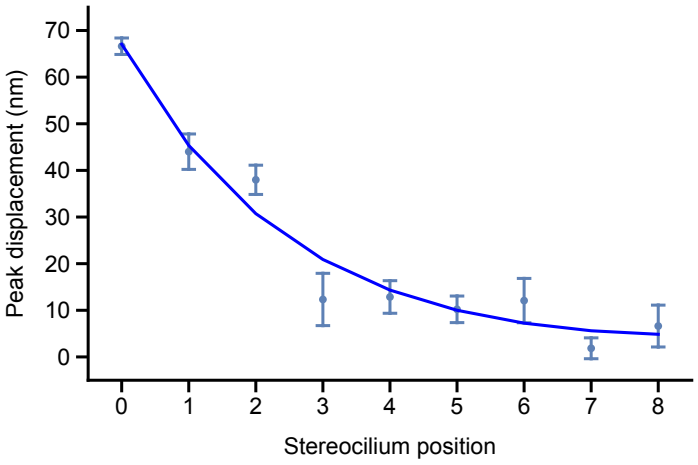
analwingindex = 9

wingindexnum = 13

S8802010_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.156145	0.0195441	7.98937	0.000091926	
Y0onset	67.0497	1.70487	39.3283	1.78952	$\times 10^{-9}$

AdjustedRSquared 0.991115
AIC 56.4751
BIC 57.0668
RSquared 0.993089



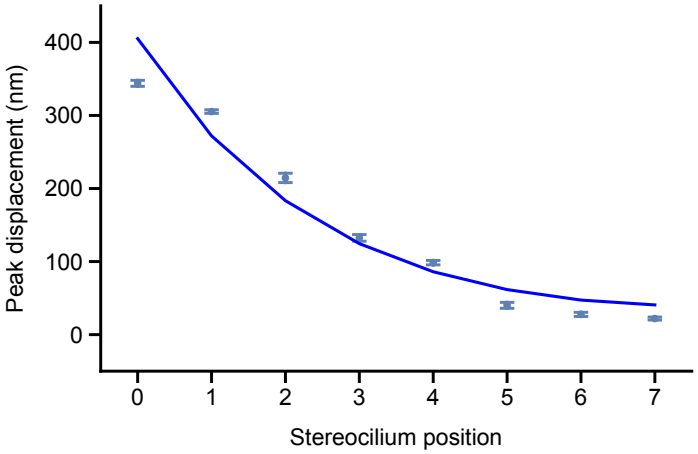
analwingindex = 10

wingindexnum = 14

S8802010_left_2

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.16321	0.0035823	45.56	7.4905	$\times 10^{-9}$
Y0onset	405.096	3.13007	129.421	1.43507	$\times 10^{-11}$

AdjustedRSquared	0.968817
AIC	651.945
BIC	652.183
RSquared	0.976612



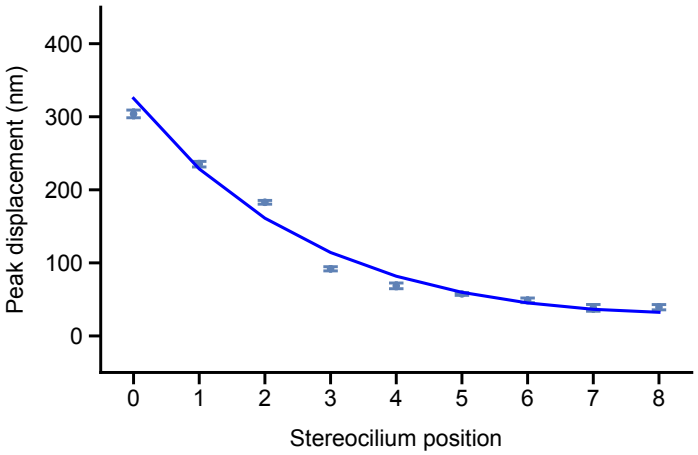
analwingindex = 11

wingindexnum = 15

S8802010_right_2

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.127102	0.0034558	36.7793	2.85479	$\times 10^{-9}$
Y0onset	325.11	3.89075	83.5599	9.25629	$\times 10^{-12}$

AdjustedRSquared	0.985262
AIC	214.082
BIC	214.674
RSquared	0.988537



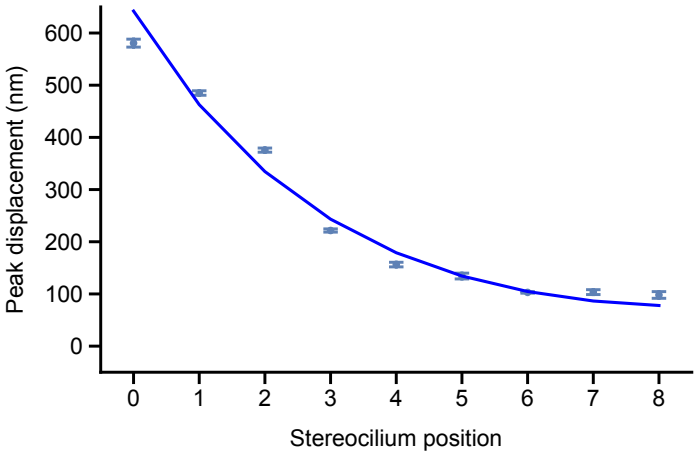
analwingindex = 12

wingindexnum = 16

S8802010_right_3

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.110505	0.00154834	71.3696	2.78823	$\times 10^{-11}$
Y0onset	642.04	4.78486	134.181	3.36824	$\times 10^{-13}$

AdjustedRSquared 0.990418
AIC 347.032
BIC 347.624
RSquared 0.992547



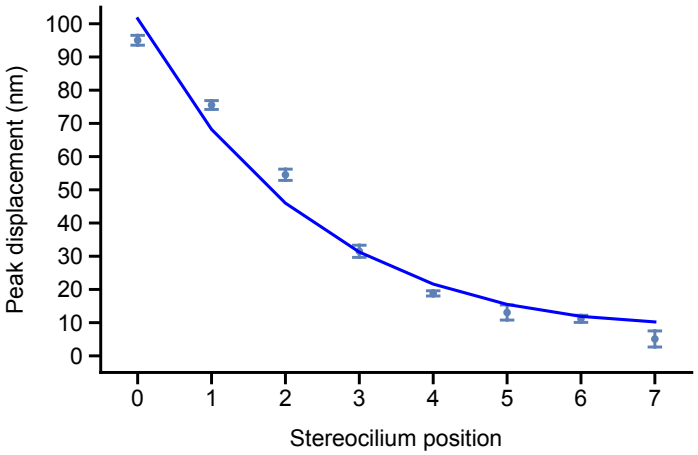
analwingindex = 13

wingindexnum = 17

S8802012_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.162855	0.00565485	28.7991	1.16094	$\times 10^{-7}$
Y0onset	101.526	1.28157	79.2194	2.72412	$\times 10^{-10}$

AdjustedRSquared 0.986658
AIC 121.305
BIC 121.544
RSquared 0.989993



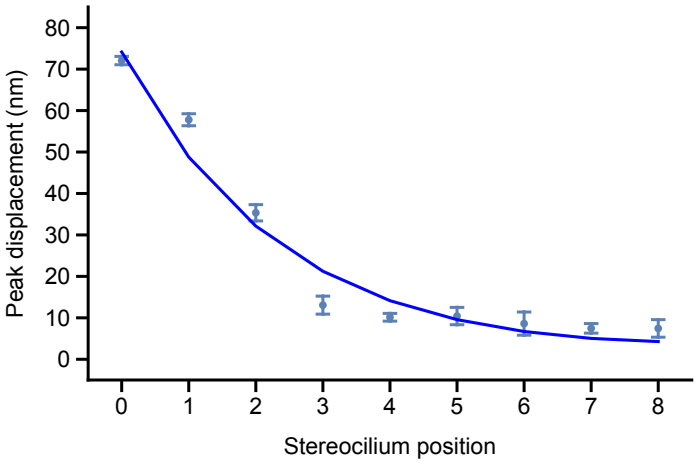
analwingindex = 14

wingindexnum = 18

S8802012_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.178796	0.0096899	18.4517	3.40416	$\times 10^{-7}$
Y0onset	74.1314	0.951961	77.8723	1.51543	$\times 10^{-11}$

AdjustedRSquared 0.984915
AIC 116.883
BIC 117.475
RSquared 0.988267



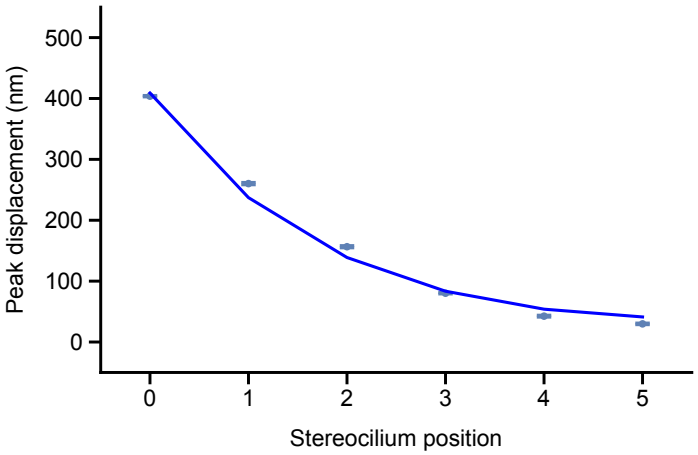
analwingindex = 15

wingindexnum = 20

S8804012_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.309909	0.00336088	92.2106	8.29252	$\times 10^{-8}$
Y0onset	409.	1.17543	347.958	4.0928	$\times 10^{-10}$

AdjustedRSquared 0.996052
AIC 392.652
BIC 392.027
RSquared 0.997368



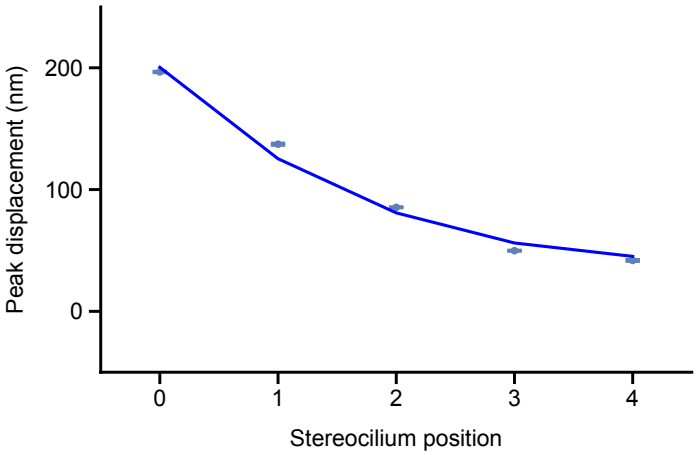
analwingindex = 16

wingindexnum = 21

S8804014_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.244084	0.00201593	121.078	1.24214	$\times 10^{-6}$
Y0onset	200.38	0.605936	330.696	6.09778	$\times 10^{-8}$

AdjustedRSquared 0.995102
AIC 495.389
BIC 494.217
RSquared 0.997061



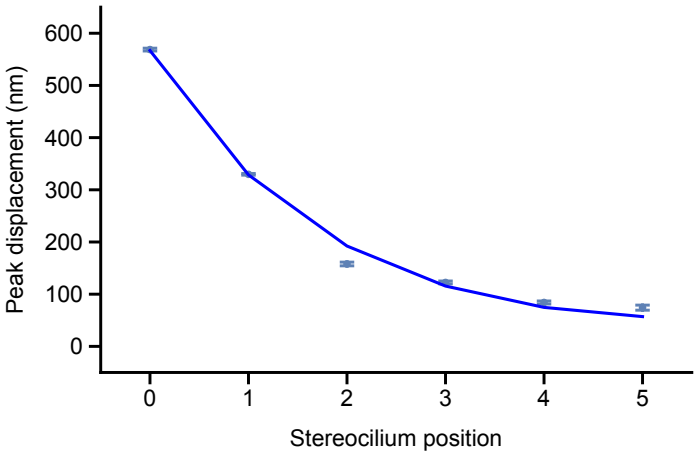
analwingindex = 17

wingindexnum = 22

S8804020_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.310177	0.00486022	63.8196	3.61098	$\times 10^{-7}$
Y0onset	566.882	2.41682	234.557	1.982	$\times 10^{-9}$

AdjustedRSquared 0.998039
AIC 152.575
BIC 151.95
RSquared 0.998693



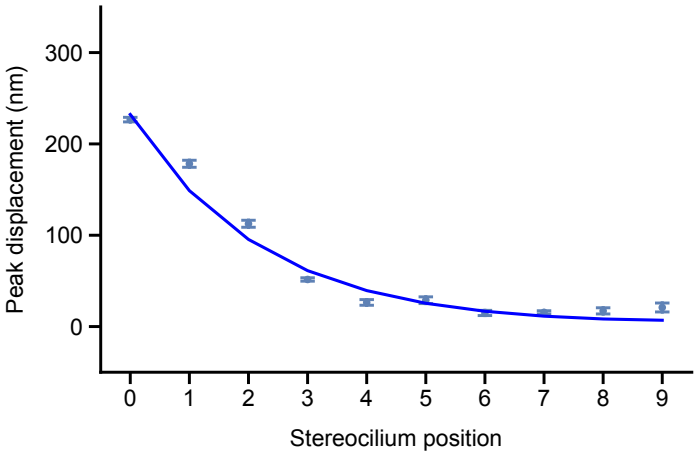
analwingindex = 18

wingindexnum = 24

S8807001_right_2

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.201695	0.00690555	29.2077	2.04475	$\times 10^{-9}$
Y0onset	232.251	2.37952	97.6038	1.35572	$\times 10^{-13}$

AdjustedRSquared 0.984613
AIC 197.191
BIC 198.099
RSquared 0.987691



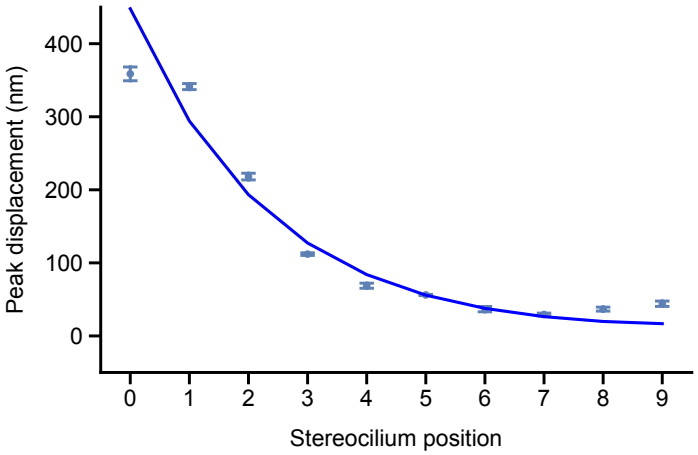
analwingindex = 19

wingindexnum = 25

S8807001_right_3

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.179807	0.00317212	56.6834	1.04156	$\times 10^{-11}$
Y0onset	447.833	5.53093	80.9688	6.03628	$\times 10^{-13}$

AdjustedRSquared 0.973665
AIC 483.505
BIC 484.412
RSquared 0.978932



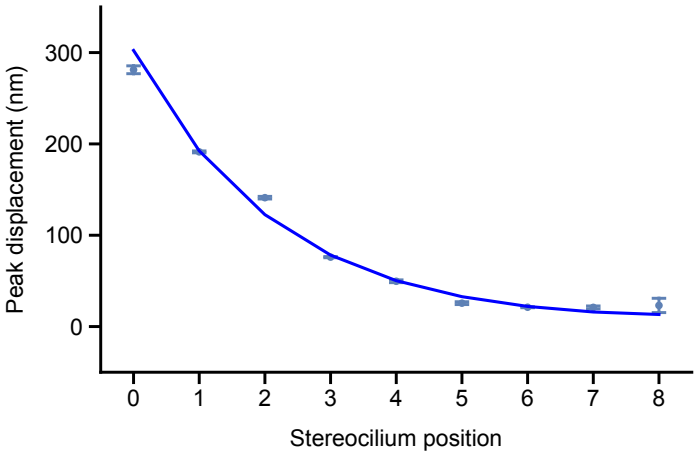
analwingindex = 20

wingindexnum = 26

S8807003_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.208526	0.00275186	75.7766	1.83393	$\times 10^{-11}$
Y0onset	302.342	1.96713	153.697	1.30232	$\times 10^{-13}$

AdjustedRSquared 0.9952
AIC 274.789
BIC 275.381
RSquared 0.996267



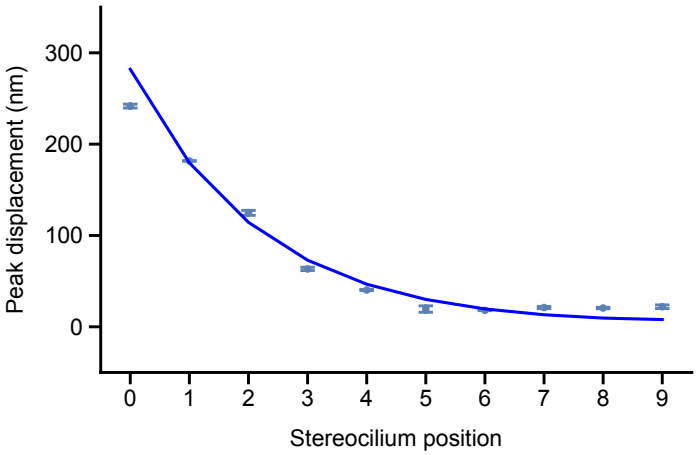
analwingindex = 21

wingindexnum = 27

S8807004_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.207544	0.00204634	101.422	9.97595	$\times 10^{-14}$
Y0onset	281.972	0.83393	338.124	6.55393	$\times 10^{-18}$

AdjustedRSquared 0.996726
AIC 895.519
BIC 896.427
RSquared 0.997381



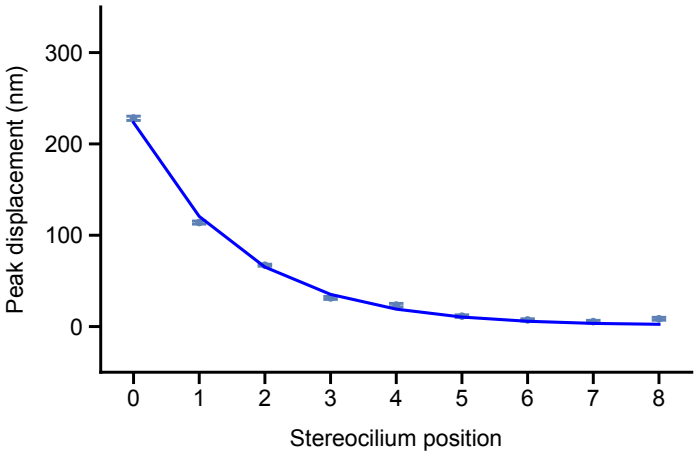
analwingindex = 22

wingindexnum = 28

S8807018_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.391498	0.0102408	38.2293	2.18043	$\times 10^{-9}$
Y0onset	223.285	2.14747	103.976	2.00615	$\times 10^{-12}$

AdjustedRSquared 0.996254
AIC 84.0283
BIC 84.62
RSquared 0.997086



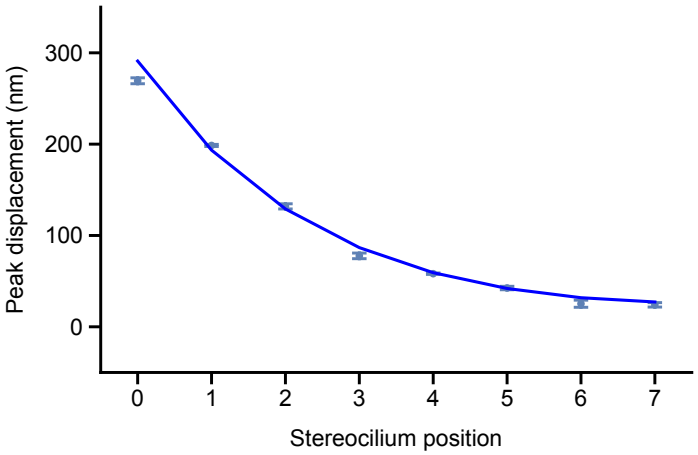
analwingindex = 23

wingindexnum = 29

S8808003_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.17132	0.00288044	59.4771	1.518	$\times 10^{-9}$
Y0onset	290.961	1.95342	148.949	6.17681	$\times 10^{-12}$

AdjustedRSquared 0.997645
AIC 113.717
BIC 113.956
RSquared 0.998234



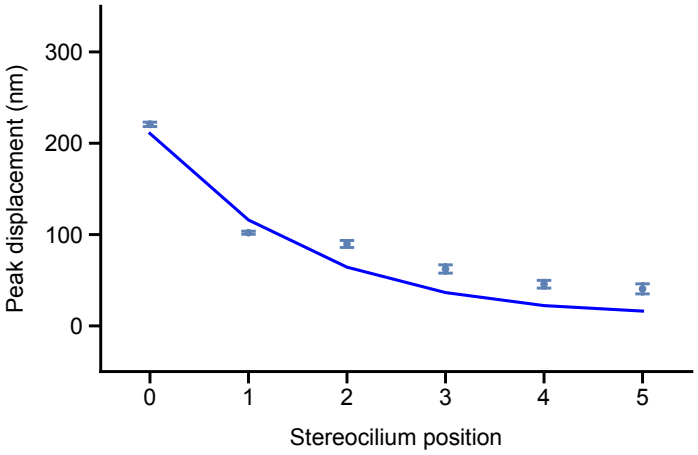
analwingindex = 24

wingindexnum = 30

S8809001_left_2

	Estimate	Standard Error	t-Statistic	P-Value
AoL	0.371074	0.0180049	20.6096	0.0000327405
Y0onset	210.673	2.3045	91.4182	8.5837 $\times 10^{-8}$

AdjustedRSquared 0.975451
AIC 243.785
BIC 243.16
RSquared 0.983634



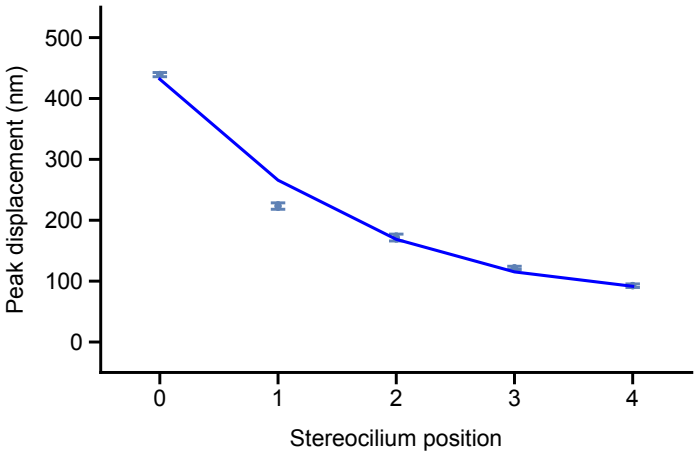
analwingindex = 25

wingindexnum = 31

S8809001_left_3

	Estimate	Standard Error	t-Statistic	P-Value
AoL	0.258737	0.00545807	47.4046	0.0000206688
Y0onset	431.647	3.30858	130.463	9.92924 $\times 10^{-7}$

AdjustedRSquared 0.994222
AIC 105.205
BIC 104.033
RSquared 0.996533



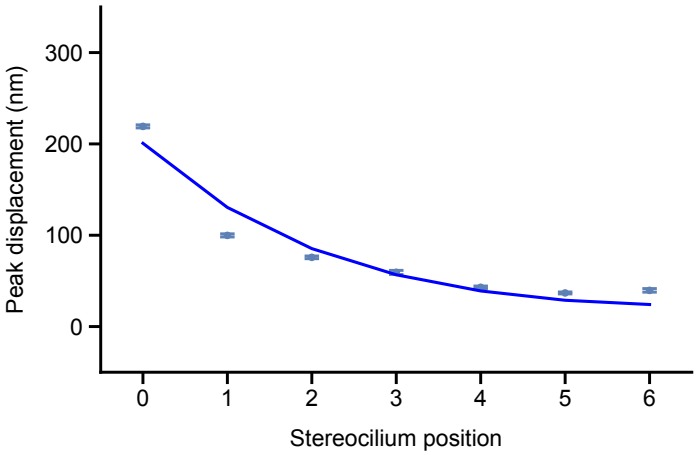
analwingindex = 26

wingindexnum = 32

S8809003_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.192735	0.00395807	48.6942	6.90171	$\times 10^{-8}$
Y0onset	200.683	1.49131	134.569	4.29858	$\times 10^{-10}$

AdjustedRSquared 0.967583
AIC 641.286
BIC 641.124
RSquared 0.976845



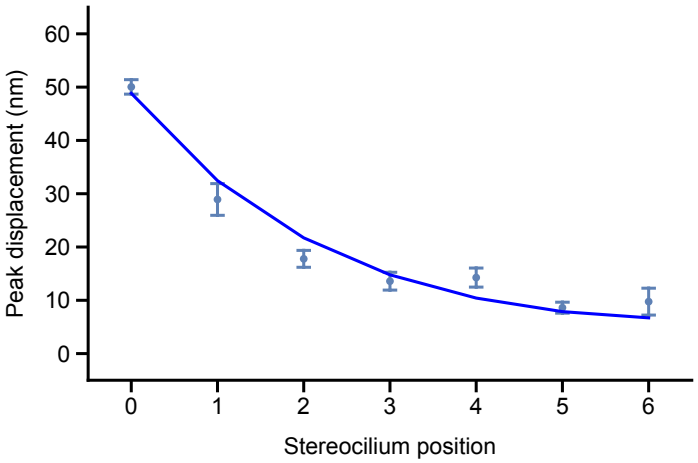
analwingindex = 27

wingindexnum = 33

S8809009_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.174456	0.0140221	12.4415	0.0000594759	
Y0onset	48.8343	1.30129	37.5275	2.5308	$\times 10^{-7}$

AdjustedRSquared 0.987909
AIC 42.1609
BIC 41.9986
RSquared 0.991363



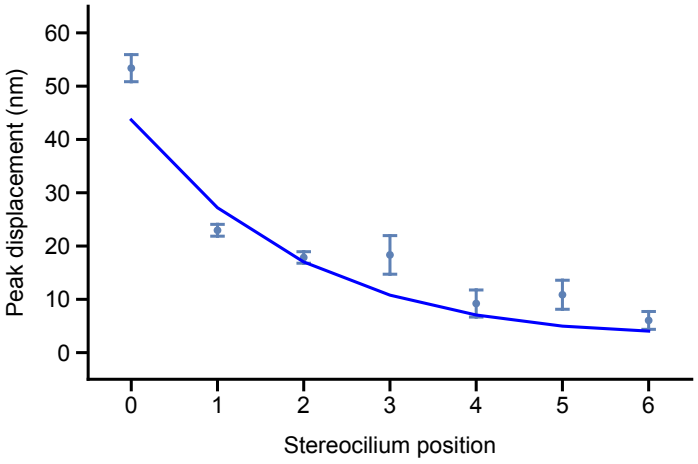
analwingindex = 28

wingindexnum = 34

S8809011_left_1

	Estimate	Standard Error	t-Statistic	P-Value
AoL	0.231913	0.032071	7.23125	0.000789093
Y0onset	43.6601	1.98361	22.0105	3.59419 $\times 10^{-6}$

AdjustedRSquared 0.952635
AIC 69.5074
BIC 69.3451
RSquared 0.966168



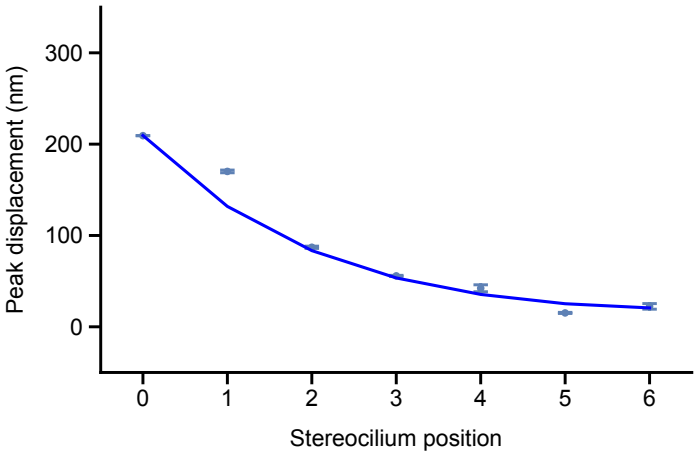
analwingindex = 29

wingindexnum = 35

S8811007_left_1

	Estimate	Standard Error	t-Statistic	P-Value
AoL	0.221795	0.00227751	97.3849	2.16449 $\times 10^{-9}$
Y0onset	209.467	0.133192	1572.67	1.97296 $\times 10^{-15}$

AdjustedRSquared 0.999442
AIC 1012.63
BIC 1012.46
RSquared 0.999601



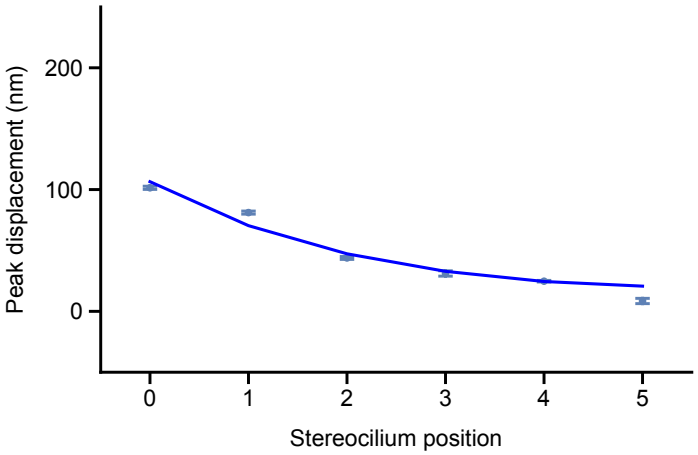
analwingindex = 30

wingindexnum = 36

S8811009_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.184474	0.00511568	36.0604	3.53024	$\times 10^{-6}$
Y0onset	106.466	1.1629	91.5526	8.53341	$\times 10^{-8}$

AdjustedRSquared 0.985373
AIC 148.754
BIC 148.129
RSquared 0.990249



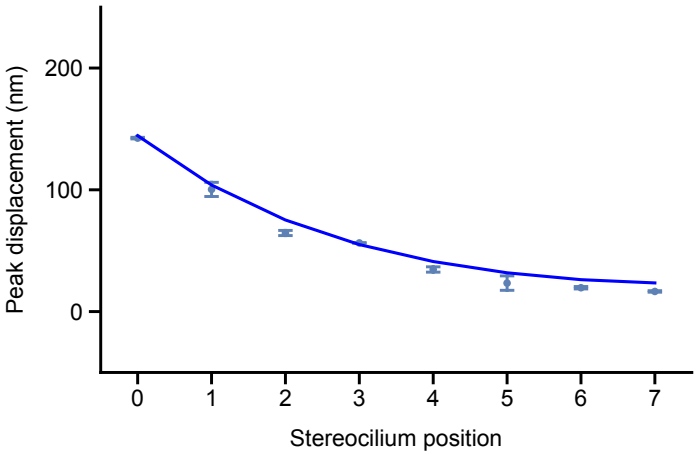
analwingindex = 31

wingindexnum = 37

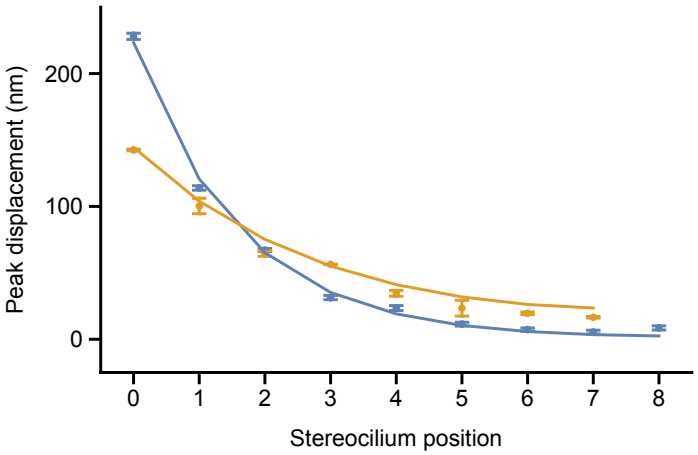
S8811019_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.113523	0.001125	100.91	6.38322	$\times 10^{-11}$
Y0onset	144.43	0.632326	228.411	4.75196	$\times 10^{-13}$

AdjustedRSquared 0.997015
AIC 288.119
BIC 288.357
RSquared 0.997761


Peak displacement (nm)
200
100
0
0
1
2
3
4
5
6
7
Stereocilium position

In[57]:=
```
(*Example wings*)
wingindexnum1 = 28;
wingindexnum2 = 37;
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax =
  Max[Length[onsetList[[wingindexnum1, 2]]], Length[onsetList[[wingindexnum2, 2]]]] - 1;
Ymin = 0;
deltaY =
 10^(MantissaExponent[Max[onsetList[[wingindexnum1, 2, 1, 2]]["Value"] + onsetList[[
           wingindexnum1, 2, 1, 2]]["Uncertainty"], onsetList[[wingindexnum2, 2, 1, 2]][
          "Value"] + onsetList[[wingindexnum2, 2, 1, 2]]["Uncertainty"]]][[2]] - 1);
Ymax = Ceiling[Max[onsetList[[wingindexnum1, 2, 1, 2]]["Value"] +
    onsetList[[wingindexnum1, 2, 1, 2]]["Uncertainty"], onsetList[[wingindexnum2, 2, 1,
      2]]["Value"] + onsetList[[wingindexnum2, 2, 1, 2]]["Uncertainty"]], deltaY];
Linewidth = 0.005;
Fontsize = 12;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, deltaY}];
Print[Show[ListPlot[{onsetList[[wingindexnum1, 2]], onsetList[[wingindexnum2, 2]]},
   PlotRange → {{-0.5, Xmax + 0.5}, {-deltaY / 4, Ymax - deltaY / 2}},
   PlotStyle → Thickness[Linewidth], IntervalMarkersStyle → Thickness[Linewidth],
   Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
   FrameLabel → {"Stereocilium position", "Peak displacement (nm)"}, Joined → False,
   FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}},
     {{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False], ListPlot[
   {Table[{onsetList[[wingindexnum1, 2, n, 1]], YPW[onsetAoLList[[wingindexnum1, 1, 2]],
       n, Length[onsetList[[wingindexnum1, 2]]], onsetY0List[[wingindexnum1, 1, 2]]]},
     {n, 1, Length[onsetList[[wingindexnum1, 2]]]}],
    Table[{onsetList[[wingindexnum2, 2, n, 1]], YPW[onsetAoLList[[wingindexnum2, 1, 2]],
       n, Length[onsetList[[wingindexnum2, 2]]], onsetY0List[[wingindexnum2, 1, 2]]]},
     {n, 1, Length[onsetList[[wingindexnum2, 2]]]}]},
   PlotStyle → Thickness[Linewidth], Joined → True]]]
onsetAoLList[[wingindexnum1, 1, 2]]
onsetAoLList[[wingindexnum2, 1, 2]]
onsetY0List[[wingindexnum1, 1, 2]]
onsetY0List[[wingindexnum2, 1, 2]]
```



Out[69]= 0.391498

Out[70]= 0.113523

Out[71]= 223.285

Out[72]= 144.43

In[73]:= (*****************Exported Data******************)

In[74]:=
```
Data[[wingindex[[wingindexnum1]], 1]]
onset = Table[{Data[[n, 3]], Data[[n, 4]]},
   {n, wingindex[[wingindexnum1]], If[wingindexnum1 + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum1 + 1]] - 1]}];
ss = Table[{Data[[n, 3]], Data[[n, 9]]},
   {n, wingindex[[wingindexnum1]], If[wingindexnum1 + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum1 + 1]] - 1]}];
onsetErr = Table[{Data[[n, 3]], Data[[n, 6]] / Sqrt[Data[[n, 5]]]},
   {n, wingindex[[wingindexnum1]], If[wingindexnum1 + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum1 + 1]] - 1]}];
nstereo = Last[onset[[All, 1]]] + 1;
fit = NonlinearModelFit[Table[onset[[n, 2]], {n, 1, Length[onset]}],
   {YPW[AoL, m, nstereo, Y0onset]}, {AoL, {Y0onset, onset[[1, 2]]}},
   m, Weights → Table[1 / onsetErr[[n, 2]]^2, {n, 1, Length[onset]}],
   VarianceEstimatorFunction → (1 &)];
onsetAoLList[[wingindexnum1, 1, 2]] = Evaluate[AoL /. fit["BestFitParameters"][[1]]];
onsetAoLList[[wingindexnum1, 2]] = Evaluate[fit["ParameterErrors"][[1]]];
onsetY0List[[wingindexnum1, 1, 2]] = Evaluate[Y0onset /. fit["BestFitParameters"][[2]]];
onsetY0List[[wingindexnum1, 2]] = Evaluate[fit["ParameterErrors"][[2]]];
onsetAdjRsqList[[wingindexnum1, 2]] = Evaluate[fit["AdjustedRSquared"]];
Print[Data[[wingindex[[wingindexnum1]], 1]]];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

Out[74]= S8807018_1_right

S8807018_1_right

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.391498	0.0102408	38.2293	2.18043	$\times 10^{-9}$
Y0onset	223.285	2.14747	103.976	2.00615	$\times 10^{-12}$

AdjustedRSquared	0.996254
AIC	84.0283
BIC	84.62
RSquared	0.997086

In[88]:=
```
Data[[wingindex[[wingindexnum2]], 1]]
onset = Table[{Data[[n, 3]], Data[[n, 4]]},
   {n, wingindex[[wingindexnum2]], If[wingindexnum2 + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum2 + 1]] - 1]}];
ss = Table[{Data[[n, 3]], Data[[n, 9]]},
   {n, wingindex[[wingindexnum2]], If[wingindexnum2 + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum2 + 1]] - 1]}];
onsetErr = Table[{Data[[n, 3]], Data[[n, 6]] / Sqrt[Data[[n, 5]]]},
   {n, wingindex[[wingindexnum2]], If[wingindexnum2 + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum2 + 1]] - 1]}];
nstereo = Last[onset[[All, 1]]] + 1;
fit = NonlinearModelFit[Table[onset[[n, 2]], {n, 1, Length[onset]}],
   {YPW[AoL, m, nstereo, Y0onset]}, {AoL, {Y0onset, onset[[1, 2]]}},
   m, Weights → Table[1 / onsetErr[[n, 2]]^2, {n, 1, Length[onset]}],
   VarianceEstimatorFunction → (1 &)];
onsetAoLList[[wingindexnum2, 1, 2]] = Evaluate[AoL /. fit["BestFitParameters"][[1]]];
onsetAoLList[[wingindexnum2, 2]] = Evaluate[fit["ParameterErrors"][[1]]];
onsetY0List[[wingindexnum2, 1, 2]] = Evaluate[Y0onset /. fit["BestFitParameters"][[2]]];
onsetY0List[[wingindexnum2, 2]] = Evaluate[fit["ParameterErrors"][[2]]];
onsetAdjRsqList[[wingindexnum2, 2]] = Evaluate[fit["AdjustedRSquared"]];
Print[Data[[wingindex[[wingindexnum2]], 1]]];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

Out[88]=
```
S8811019_1_left
```

```
S8811019_1_left
```

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.113523	0.001125	100.91	6.38322	$\times 10^{-11}$
Y0onset	144.43	0.632326	228.411	4.75196	$\times 10^{-13}$

```
AdjustedRSquared 0.997015
AIC              288.119
BIC              288.357
RSquared         0.997761
```

In[102]:=
```
(*Remove NaN entries*)
baddata[entry_] := MatchQ[entry, {{_?NumberQ, NaN}, NaN}];
onsetnstereoListrenum = DeleteCases[onsetnstereoList, NaN];
onsetAoLListtemp = DeleteCases[onsetAoLList, _?baddata];
onsetAoLListrenum = Table[{{n, onsetAoLListtemp[[n, 1, 2]]}, onsetAoLListtemp[[n, 2]]},
   {n, 1, Length[onsetAoLListtemp]}];
baddata2[entry_] := MatchQ[entry, {_?NumberQ, NaN}];
onsetAdjRsqListtemp = DeleteCases[onsetAdjRsqList, _?baddata2];
onsetAdjRsqListrenum =
  Table[{{n, onsetAdjRsqListtemp[[n, 2]]}}, {n, 1, Length[onsetAdjRsqListtemp]}];
```

In[109]:=
```
(*Minimum and maximum ratios*)
Min[onsetAoLListrenum[[All, 1, 2]]]
Max[onsetAoLListrenum[[All, 1, 2]]]
```

Out[109]= 0.110505

Out[110]= 0.391498

In[111]:=
```
MedianOnsetAoL = Quantile[onsetAoLListrenum[[All, 1, 2]], 0.5]
LowerQuantileOnsetAoL = Quantile[onsetAoLListrenum[[All, 1, 2]], 0.25]
UpperQuantileOnsetAoL = Quantile[onsetAoLListrenum[[All, 1, 2]], 0.75]
```

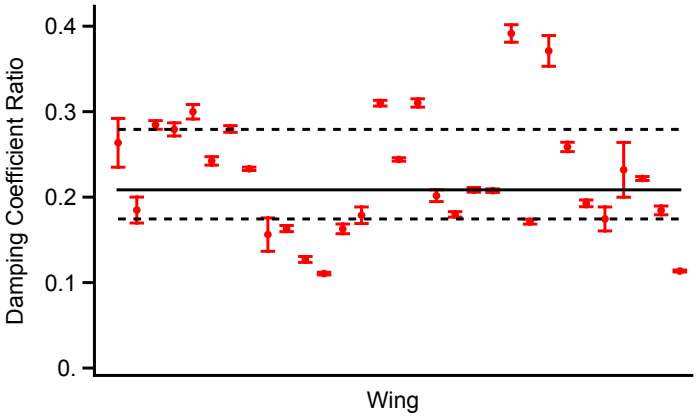
Out[111]= 0.208526

Out[112]= 0.174456

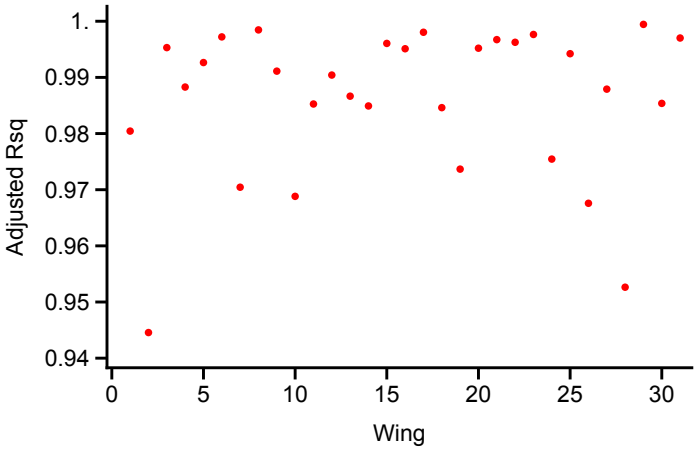
Out[113]= 0.279249

In[114]:=
```
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = Length[onsetAoLListrenum];
Ymin = 0; Ymax = 1;
Linewidth = 0.005;
Fontsize = 12;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 5}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 0.1}];
Show[ListPlot[Table[{onsetAoLListrenum[[n, 1, 1]], Around[onsetAoLListrenum[[n, 1, 2]],
      onsetAoLListrenum[[n, 2]]]}, {n, 1, Length[onsetAoLListrenum]}],
  PlotRange → All, PlotStyle → {Thickness[Linewidth], Red},
  IntervalMarkersStyle → {Thickness[Linewidth], Red},
  Frame → {{True, False}, {True, False}}, FrameTicks → {None, YTicks},
  FrameLabel → {"Wing", "Damping Coefficient Ratio"}, Joined → False,
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}},
     {{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 Plot[{MedianOnsetAoL, LowerQuantileOnsetAoL, UpperQuantileOnsetAoL},
  {n, 1, Length[onsetAoLListrenum]}, PlotStyle → {{Thickness[Linewidth], Black},
    {Thickness[Linewidth], Black, Dashed}, {Thickness[Linewidth], Black, Dashed}}]]
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = Length[onsetAoLListrenum];
Ymin = 0;
Ymax = 1;
Linewidth = 0.005;
Fontsize = 12;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 5}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 0.01}];
ListPlot[Table[{onsetAoLListrenum[[n, 1, 1]], onsetAdjRsqListrenum[[n, 1, 2]]},
  {n, 1, Length[onsetAoLListrenum]}],
 PlotRange → All, PlotStyle → {Thickness[Linewidth], Red},
 IntervalMarkersStyle → Thickness[Linewidth], Frame → {{True, False}, {True, False}},
 FrameTicks → {XTicks, YTicks}, FrameLabel → {"Wing", "Adjusted Rsq"},
 Joined → False, FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}},
   {{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]
```

Out[122]=



Out[132]=



In[133]:=
```
(*Minimum adjRsq*)
Min[onsetAdjRsqList[[All, 2]]]
```

Out[133]=
```
Min[0.944559, NaN]
```

In[134]:=
```
(*Maximum P-value over all fit parameters*)
Max[{onsetAoLPvalList[[All, 2]], onsetY0PvalList[[All, 2]]}]
```

Out[134]=
```
Max[0.000789093, NaN]
```

In[135]:=
```
(*****************************)
```

In[136]:=
```
ssList = Table[NaN, {n, 1, Length[wingindex]}];
ssnstereoList = Table[NaN, {n, 1, Length[wingindex]}];
ssAoLList = Table[{{n, NaN}, NaN}, {n, 1, Length[wingindex]}];
ssAoLPvalList = Table[{n, NaN}, {n, 1, Length[wingindex]}];
ssY0List = Table[{{n, NaN}, NaN}, {n, 1, Length[wingindex]}];
ssY0PvalList = Table[{n, NaN}, {n, 1, Length[wingindex]}];
ssAdjRsqList = Table[{n, NaN}, {n, 1, Length[wingindex]}];
ssExportTable = Table[{NaN, NaN, NaN, NaN, NaN, NaN}, {n, 1, Length[wingindex]}];
```

In[144]:=
```
(*Fit wings with all positive onsets and ss*)
(*Index of analyzed wings*)
analwingindex = 0;
```

```
(*Fit weights are 1/SE^2 and there is a
 different number of points in each measurement window*)
For[wingindexnum = 1, wingindexnum ≤ Length[wingindex], wingindexnum++,
 onset = Table[{Data[[n, 3]], Data[[n, 4]]},
   {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}];
 ss = Table[{Data[[n, 3]], Data[[n, 9]]},
   {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}];
 If[Length[Select[onset[[All, 2]], # < 0 &]] + Length[Select[ss[[All, 2]], # < 0 &]] > 0,
  Continue[], analwingindex = analwingindex + 1;
  Print["analwingindex = ", analwingindex];
  Print["wingindexnum = ", wingindexnum];
  ssErr = Table[{Data[[n, 3]], Data[[n, 11]] / Sqrt[Data[[n, 10]]]},
    {n, wingindex[[wingindexnum]], If[wingindexnum + 1 > Length[wingindex],
      Length[Data[[All, 2]]], wingindex[[wingindexnum + 1]] - 1]}];
  ssList[[wingindexnum]] = Join[{wingindexnum},
    {Table[{ss[[n, 1]], Around[ss[[n, 2]], ssErr[[n, 2]]]}, {n, 1, Length[ss]}]}];
  nstereo = Last[ss[[All, 1]]] + 1;
  fit = NonlinearModelFit[Table[ss[[n, 2]], {n, 1, Length[ss]}],
    {YPW[AoL, m, nstereo, Y0ss]}, {AoL, {Y0ss, ss[[1, 2]]}}, m,
    Weights → Table[1 / ssErr[[n, 2]]^2, {n, 1, Length[ss]}],
    VarianceEstimatorFunction → (1 &)];
  ssnstereoList[[wingindexnum]] = nstereo;
  ssAoLList[[wingindexnum, 1, 2]] = Evaluate[AoL /. fit["BestFitParameters"][[1]]];
  ssAoLList[[wingindexnum, 2]] = Evaluate[fit["ParameterErrors"][[1]]];
  ssAoLPvalList[[wingindexnum, 2]] = Evaluate[fit["ParameterTable"][[1, 1, 2, 5]]];
  ssY0List[[wingindexnum, 1, 2]] = Evaluate[Y0ss /. fit["BestFitParameters"][[2]]];
  ssY0List[[wingindexnum, 2]] = Evaluate[fit["ParameterErrors"][[2]]];
  ssY0PvalList[[wingindexnum, 2]] = Evaluate[fit["ParameterTable"][[1, 1, 3, 5]]];
  ssAdjRsqList[[wingindexnum, 2]] = Evaluate[fit["AdjustedRSquared"]];
  ssExportTable[[wingindexnum, 1]] = Data[[wingindex[[wingindexnum]], 1]];
  ssExportTable[[wingindexnum, 2]] = Evaluate[AoL /. fit["BestFitParameters"][[1]]];
  ssExportTable[[wingindexnum, 3]] = Evaluate[fit["ParameterErrors"][[1]]];
  ssExportTable[[wingindexnum, 4]] = Evaluate[Y0ss /. fit["BestFitParameters"][[2]]];
  ssExportTable[[wingindexnum, 5]] = Evaluate[fit["ParameterErrors"][[2]]];
  ssExportTable[[wingindexnum, 6]] = Evaluate[fit["AdjustedRSquared"]];
  Print[Data[[wingindex[[wingindexnum]], 2]]];
  Print[fit["ParameterTable"]];
  Print[
   Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
    Alignment → Left]];
  (*Tick Marks*)
  TickLength = 0.02;
```

```
Xmin = 0;
Xmax = nstereo - 1;
Ymin = 0;
deltaY = 10^(MantissaExponent[ssList[[wingindexnum, 2, 1, 2]]["Value"] +
        ssList[[wingindexnum, 2, 1, 2]]["Uncertainty"]][[2]] - 1);
Ymax = Ceiling[ssList[[wingindexnum, 2, 1, 2]]["Value"] +
    ssList[[wingindexnum, 2, 1, 2]]["Uncertainty"], deltaY];
Linewidth = 0.005;
Fontsize = 12;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, deltaY}];
Print[Show[ListPlot[ssList[[wingindexnum, 2]],
    PlotRange → {{-0.5, Xmax + 0.5}, {-deltaY / 2, Ymax + deltaY / 2}},
    PlotStyle → Thickness[Linewidth], IntervalMarkersStyle → Thickness[Linewidth],
    Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
    FrameLabel → {"Stereocilium position", "Steady-state displacement (nm)"},
    Joined → False, FrameStyle → {{{Black, Thickness[Linewidth],
         FontSize → Fontsize}, {Black, Thickness[Linewidth], FontSize → Fontsize}},
      {{Black, Thickness[Linewidth], FontSize → Fontsize},
       {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
   ListPlot[Table[{ss[[n, 1]], YPW[ssAoLList[[wingindexnum, 1, 2]],
       n, nstereo, ssY0List[[wingindexnum, 1, 2]]]},
     {n, 1, Length[ss]}], PlotStyle → Blue, Joined → True]]]]
```

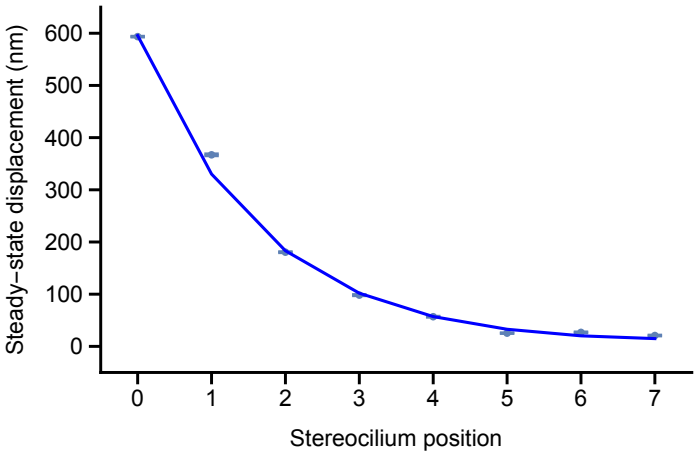
```
analwingindex = 1
```

```
wingindexnum = 1
```

S8731025_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.358482	0.00185639	193.106	1.30119	$\times 10^{-12}$
Y0ss	595.499	0.685954	868.133	1.57681	$\times 10^{-16}$

AdjustedRSquared	0.998791
AIC	767.121
BIC	767.359
RSquared	0.999093



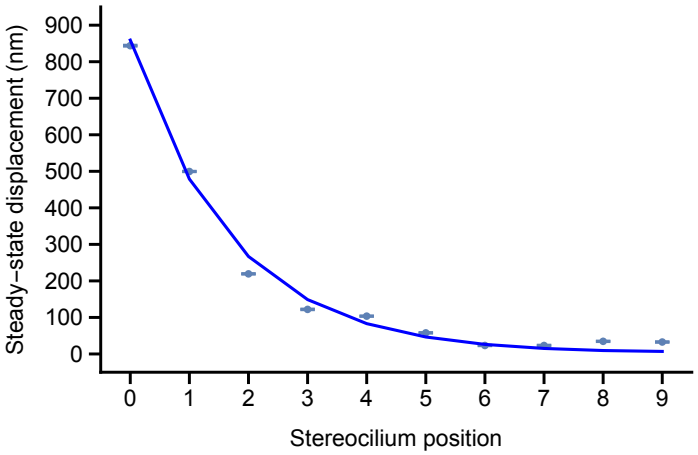
analwingindex = 2

wingindexnum = 3

S8731027_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.351645	0.00125866	279.379	3.01649	$\times 10^{-17}$
Y0ss	859.188	1.07141	801.923	6.54843	$\times 10^{-21}$

AdjustedRSquared 0.990046
AIC 10 386.8
BIC 10 387.7
RSquared 0.992037



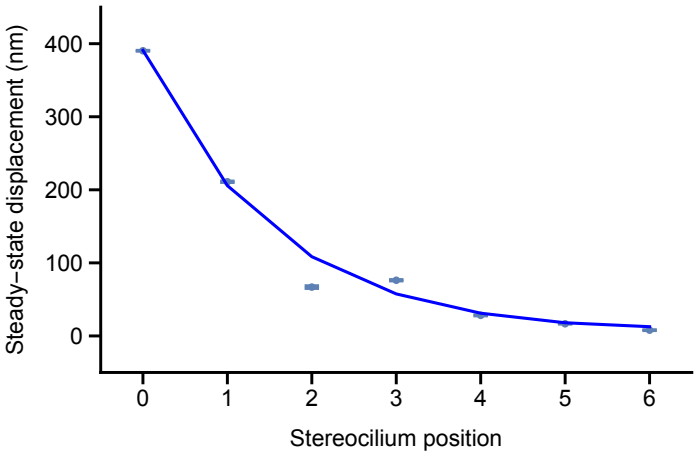
analwingindex = 3

wingindexnum = 6

S8731036_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.427258	0.00337796	126.484	5.85911	$\times 10^{-10}$
Y0ss	390.897	0.597545	654.171	1.5843	$\times 10^{-13}$

AdjustedRSquared 0.99697
AIC 1020.47
BIC 1020.3
RSquared 0.997836



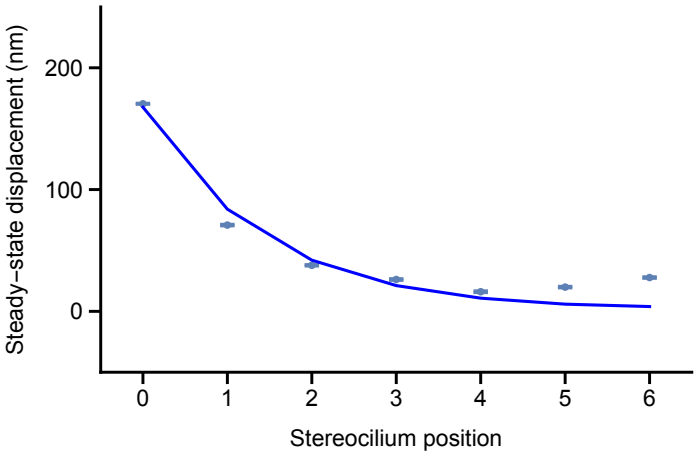
analwingindex = 4

wingindexnum = 7

S8731036_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.499242	0.0071189	70.129	1.11653	$\times 10^{-8}$
Y0ss	167.634	0.461368	363.342	2.99704	$\times 10^{-12}$

AdjustedRSquared 0.979181
AIC 2260.18
BIC 2260.02
RSquared 0.985129



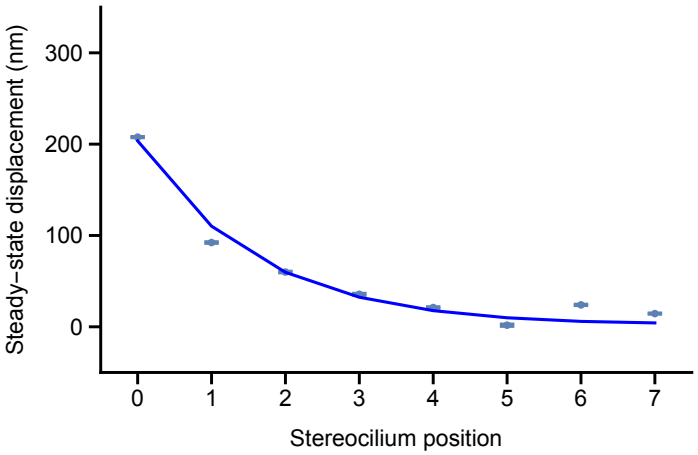
analwingindex = 5

wingindexnum = 8

S8731044_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.389159	0.00630939	61.6793	1.22087	$\times 10^{-9}$
Y0ss	203.51	0.679789	299.373	9.37464	$\times 10^{-14}$

AdjustedRSquared 0.984683
AIC 1223.94
BIC 1224.18
RSquared 0.988513



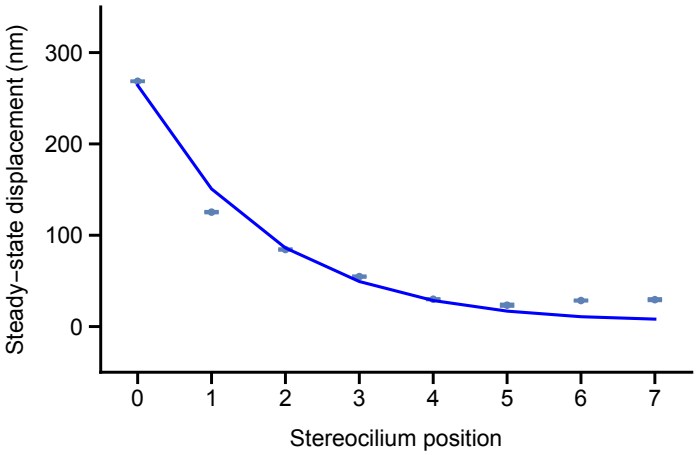
analwingindex = 6

wingindexnum = 9

S8731045_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.323449	0.00310621	104.13	5.28715	$\times 10^{-11}$
Y0ss	264.085	0.495478	532.99	2.94419	$\times 10^{-15}$

AdjustedRSquared 0.990781
AIC 2253.27
BIC 2253.51
RSquared 0.993086



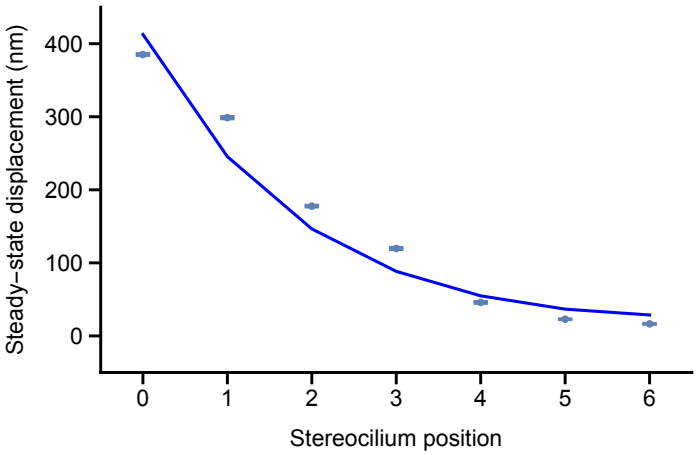
analwingindex = 7

wingindexnum = 10

S8731047_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.278512	0.00200512	138.901	3.66894	$\times 10^{-10}$
Y0ss	412.646	1.1819	349.137	3.65837	$\times 10^{-12}$

AdjustedRSquared 0.966551
AIC 3831.02
BIC 3830.86
RSquared 0.976108



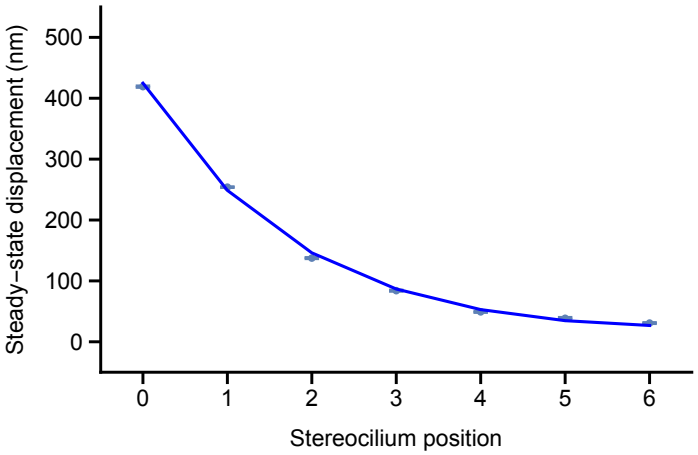
analwingindex = 8

wingindexnum = 11

S8731047_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.295559	0.00223258	132.384	4.66501	$\times 10^{-10}$
Y0ss	424.762	1.01824	417.151	1.50249	$\times 10^{-12}$

AdjustedRSquared 0.998967
AIC 253.443
BIC 253.281
RSquared 0.999262



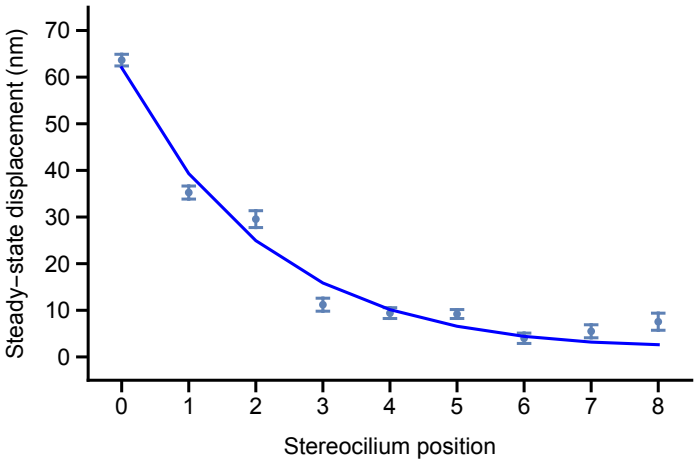
analwingindex = 9

wingindexnum = 13

S8802010_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.212211	0.0132493	16.0168	8.98189	$\times 10^{-7}$
Y0ss	62.0166	1.15096	53.8826	1.98783	$\times 10^{-10}$

AdjustedRSquared 0.984343
AIC 73.6075
BIC 74.1992
RSquared 0.987822



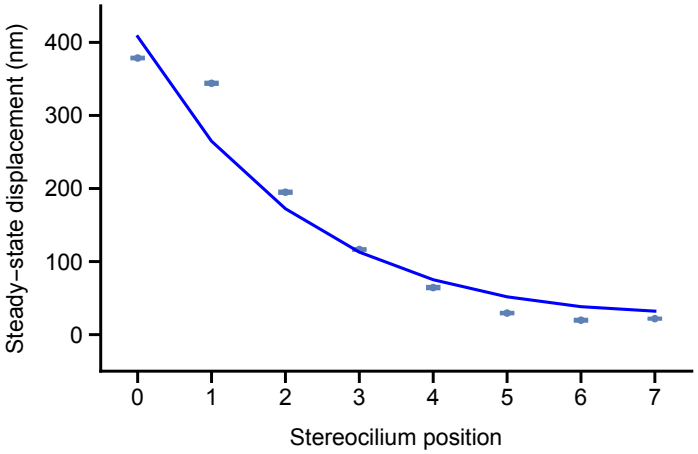
analwingindex = 10

wingindexnum = 14

S8802010_left_2

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.191542	0.00165254	115.908	2.78051	$\times 10^{-11}$
Y0ss	407.909	1.13773	358.527	3.17773	$\times 10^{-14}$

AdjustedRSquared 0.96804
AIC 4023.08
BIC 4023.32
RSquared 0.97603



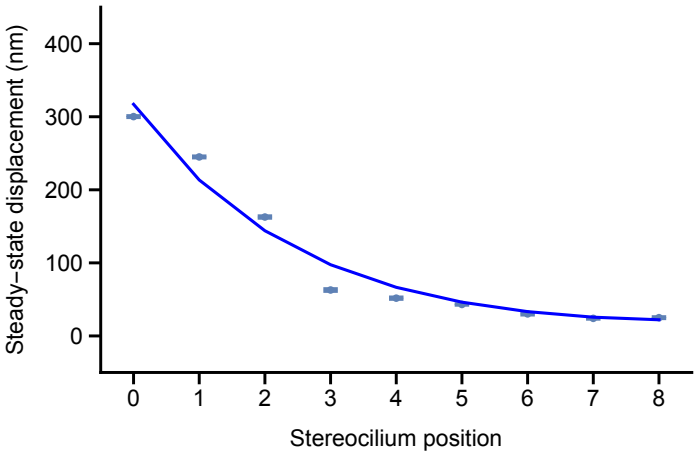
analwingindex = 11

wingindexnum = 15

S8802010_right_2

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.159703	0.001926	82.9194	9.76804	$\times 10^{-12}$
Y0ss	317.061	1.19436	265.465	2.84178	$\times 10^{-15}$

AdjustedRSquared 0.983266
AIC 1266.05
BIC 1266.64
RSquared 0.986984



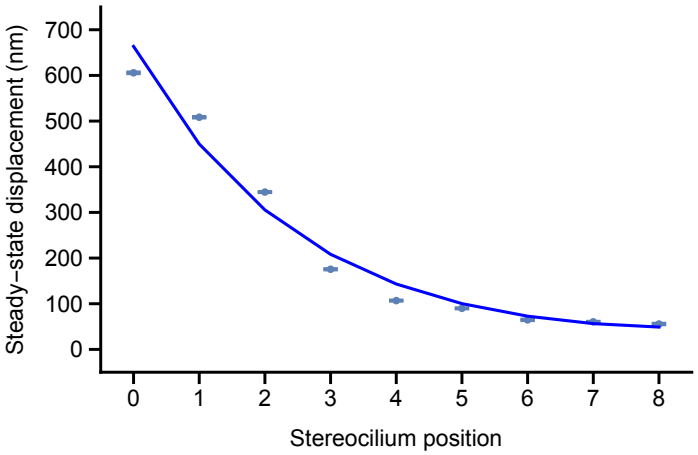
analwingindex = 12

wingindexnum = 16

S8802010_right_3

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.154369	0.000951494	162.238	8.91956	$\times 10^{-14}$
Y0ss	663.534	1.57801	420.488	1.13617	$\times 10^{-16}$

AdjustedRSquared 0.980587
AIC 4653.31
BIC 4653.9
RSquared 0.984901



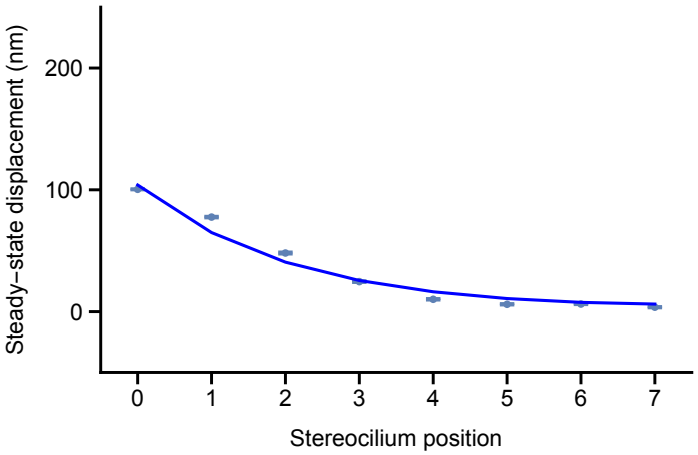
analwingindex = 13

wingindexnum = 17

S8802012_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.227344	0.00395393	57.4983	1.85912	$\times 10^{-9}$
Y0ss	103.944	0.443022	234.625	4.04519	$\times 10^{-13}$

AdjustedRSquared 0.985847
AIC 700.202
BIC 700.44
RSquared 0.989385



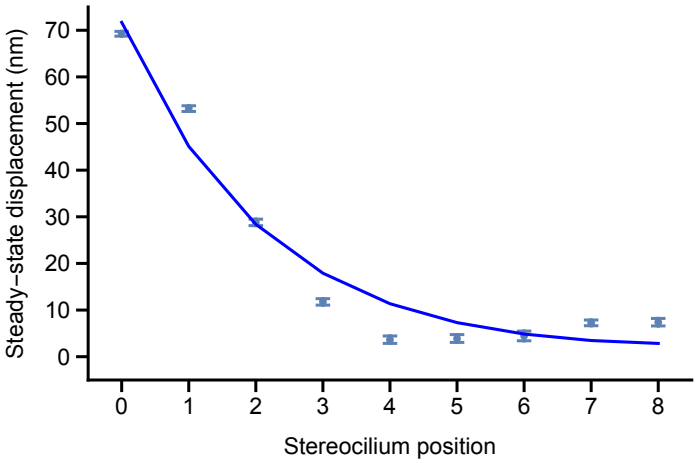
analwingindex = 14

wingindexnum = 18

S8802012_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.219477	0.00648348	33.8518	5.08716	$\times 10^{-9}$
Y0ss	71.692	0.486209	147.451	1.74103	$\times 10^{-13}$

AdjustedRSquared	0.978881
AIC	476.098
BIC	476.69
RSquared	0.983574



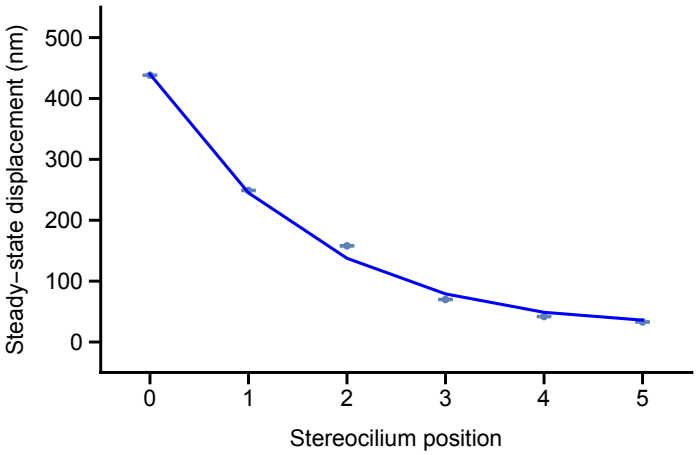
analwingindex = 15

wingindexnum = 20

S8804012_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.356876	0.0013824	258.156	1.35075	$\times 10^{-9}$
Y0ss	439.914	0.383159	1148.12	3.453	$\times 10^{-12}$

AdjustedRSquared	0.998388
AIC	1602.41
BIC	1601.79
RSquared	0.998925



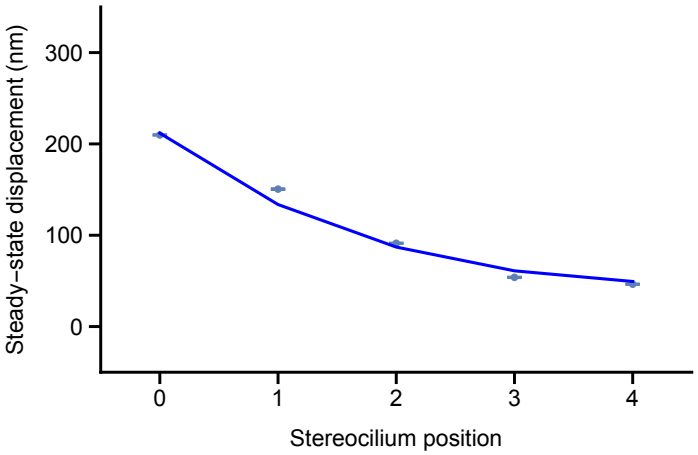
analwingindex = 16

wingindexnum = 21

S8804014_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.235891	0.000740855	318.404	6.83155	$\times 10^{-8}$
Y0ss	211.727	0.19485	1086.61	1.71887	$\times 10^{-9}$

AdjustedRSquared 0.996992
AIC 2671.03
BIC 2669.85
RSquared 0.998195



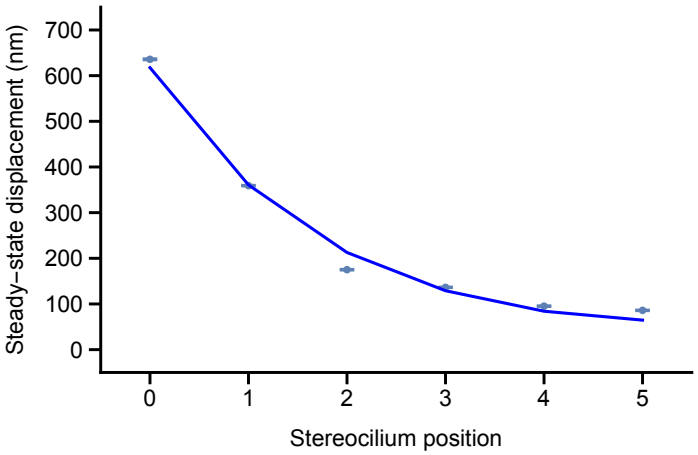
analwingindex = 17

wingindexnum = 22

S8804020_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.301667	0.0012111	249.084	1.55854	$\times 10^{-9}$
Y0ss	617.46	0.986045	626.198	3.90208	$\times 10^{-11}$

AdjustedRSquared 0.990997
AIC 4115.41
BIC 4114.78
RSquared 0.993998



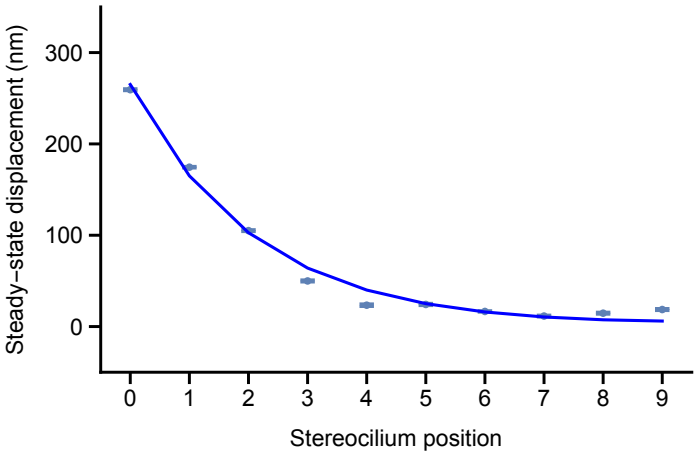
analwingindex = 18

wingindexnum = 24

S8807001_right_2

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.229074	0.00311881	73.449	1.31526	$\times 10^{-12}$
Y0ss	265.051	0.994446	266.531	4.39604	$\times 10^{-17}$

AdjustedRSquared 0.993007
AIC 611.791
BIC 612.699
RSquared 0.994406



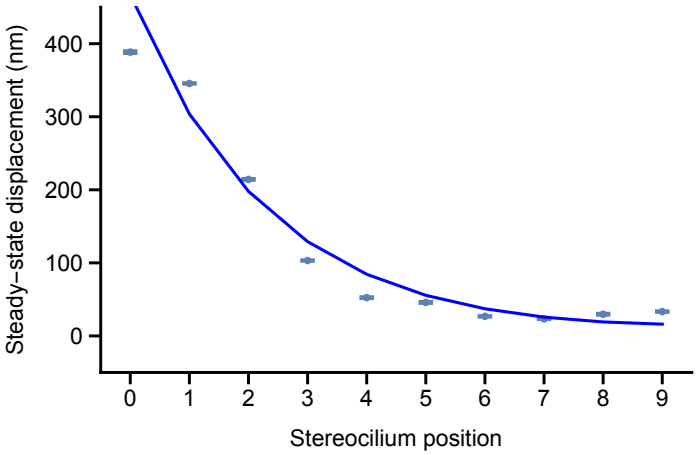
analwingindex = 19

wingindexnum = 25

S8807001_right_3

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.187506	0.00159919	117.25	3.12893	$\times 10^{-14}$
Y0ss	466.674	1.43236	325.807	8.81895	$\times 10^{-18}$

AdjustedRSquared 0.967909
AIC 5300.42
BIC 5301.33
RSquared 0.974327



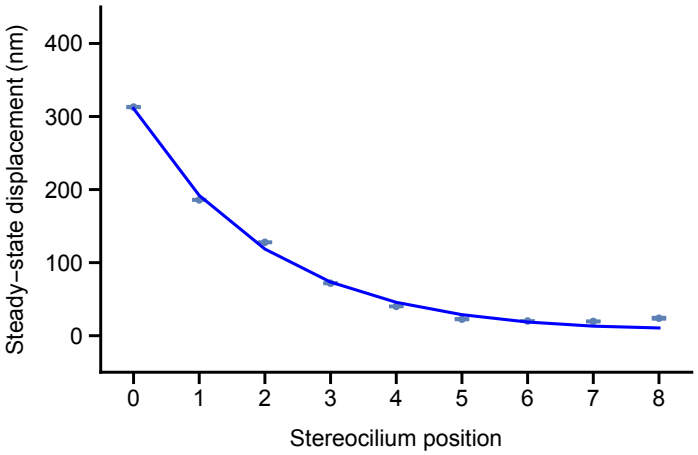
analwingindex = 20

wingindexnum = 26

S8807003_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.237612	0.00179167	132.62	3.65571	$\times 10^{-13}$
Y0ss	310.935	0.79452	391.35	1.87826	$\times 10^{-16}$

AdjustedRSquared 0.996661
AIC 645.08
BIC 645.672
RSquared 0.997403



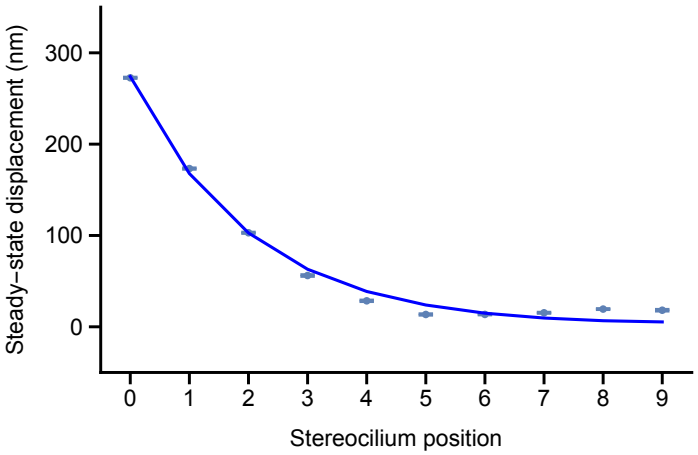
analwingindex = 21

wingindexnum = 27

S8807004_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.245501	0.00207314	118.42	2.89023	$\times 10^{-14}$
Y0ss	273.984	0.627564	436.584	8.48423	$\times 10^{-19}$

AdjustedRSquared 0.993181
AIC 1403.23
BIC 1404.14
RSquared 0.994545



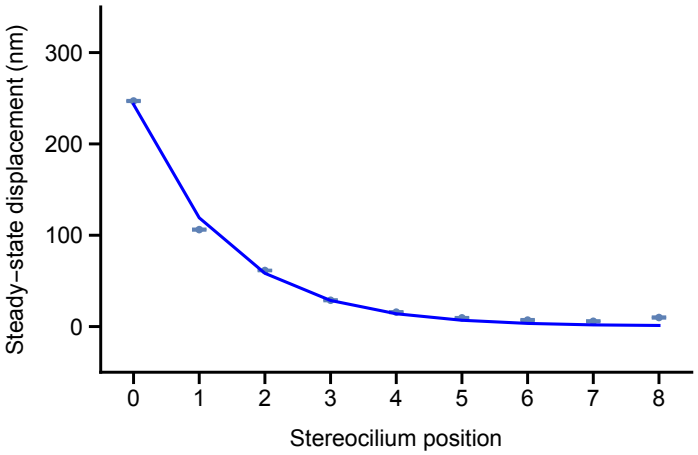
analwingindex = 22

wingindexnum = 28

S8807018_right_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.531762	0.00465741	114.175	1.04242	$\times 10^{-12}$
Y0ss	243.2	0.652126	372.934	2.63201	$\times 10^{-16}$

AdjustedRSquared	0.99514
AIC	717.181
BIC	717.773
RSquared	0.99622



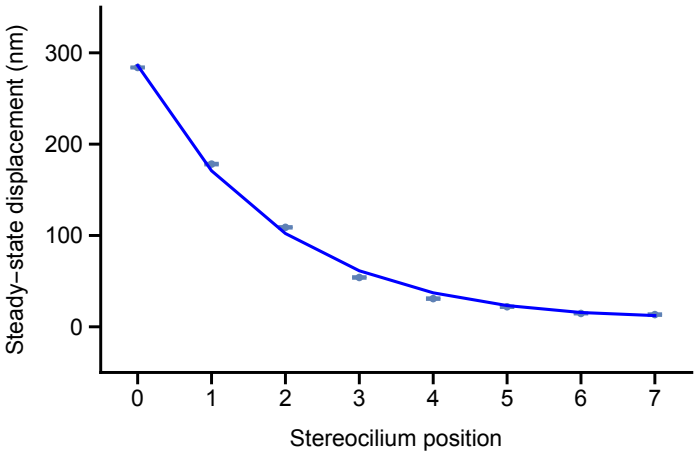
analwingindex = 23

wingindexnum = 29

S8808003_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.272787	0.0023767	114.775	2.94911	$\times 10^{-11}$
Y0ss	286.142	0.616681	464.003	6.76309	$\times 10^{-15}$

AdjustedRSquared	0.998576
AIC	290.62
BIC	290.858
RSquared	0.998932



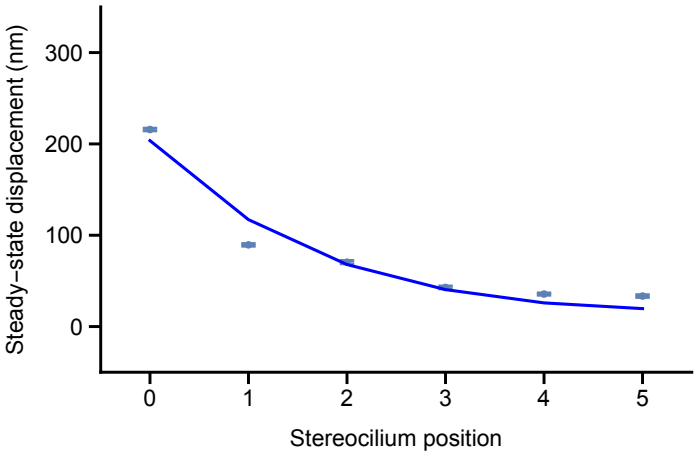
analwingindex = 24

wingindexnum = 30

S8809001_left_2

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.319201	0.00714069	44.7017	1.49764	$\times 10^{-6}$
Y0ss	203.576	1.33953	151.976	1.12443	$\times 10^{-8}$

AdjustedRSquared	0.970207
AIC	623.738
BIC	623.113
RSquared	0.980138



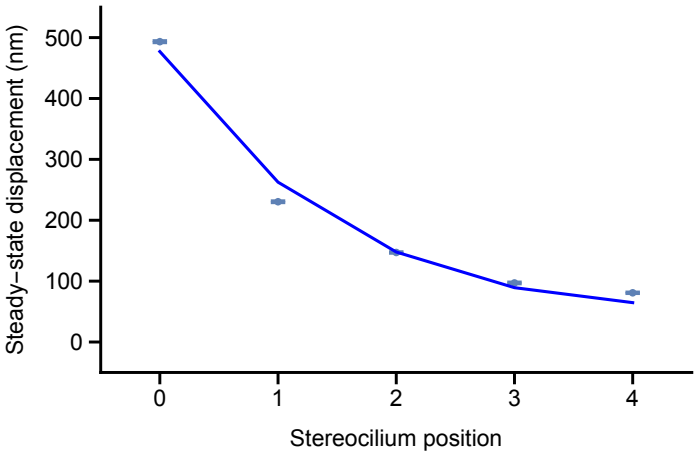
analwingindex = 25

wingindexnum = 31

S8809001_left_3

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.380194	0.00356776	106.564	1.82182	$\times 10^{-6}$
Y0ss	477.065	1.60076	298.024	8.33101	$\times 10^{-8}$

AdjustedRSquared	0.99056
AIC	735.931
BIC	734.76
RSquared	0.994336



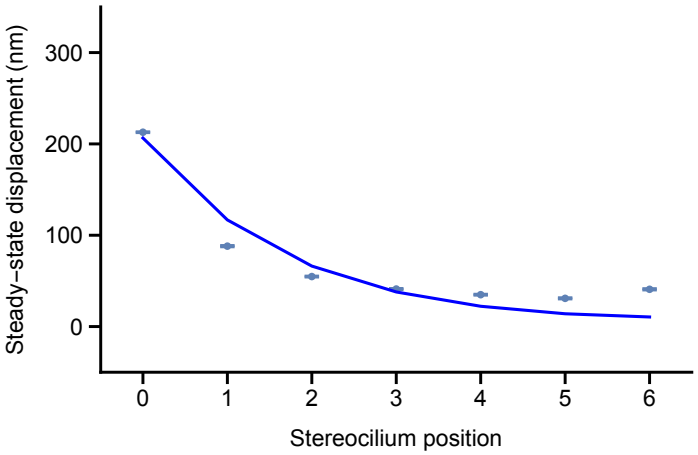
analwingindex = 26

wingindexnum = 32

S8809003_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.335064	0.00290199	115.46	9.2426	$\times 10^{-10}$
Y0ss	206.435	0.416942	495.116	6.37897	$\times 10^{-13}$

AdjustedRSquared 0.97283
AIC 5645.6
BIC 5645.44
RSquared 0.980593



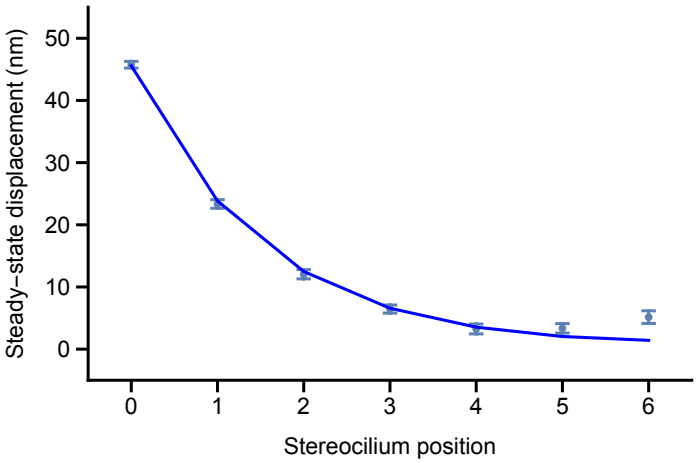
analwingindex = 27

wingindexnum = 33

S8809009_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.435486	0.0238972	18.2233	9.14659	$\times 10^{-6}$
Y0ss	45.5727	0.522195	87.2715	3.74395	$\times 10^{-9}$

AdjustedRSquared 0.997212
AIC 32.1389
BIC 31.9766
RSquared 0.998009



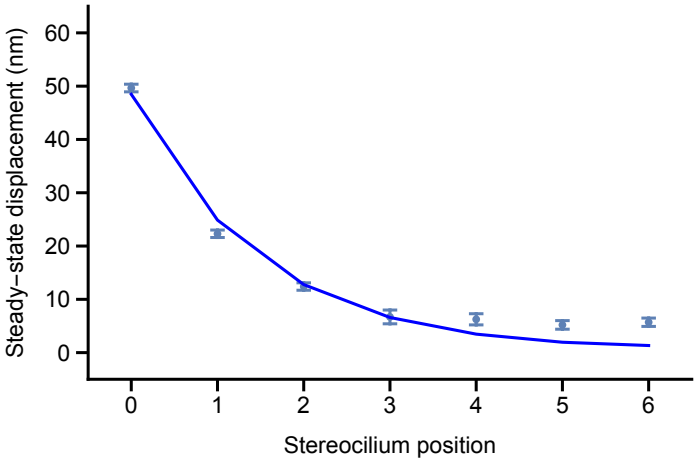
analwingindex = 28

wingindexnum = 34

S8809011_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.463083	0.0279725	16.5549	0.0000146837	
Y0ss	48.4728	0.693239	69.9222	1.13312	$\times 10^{-8}$

AdjustedRSquared 0.984236
AIC 87.3517
BIC 87.1894
RSquared 0.98874



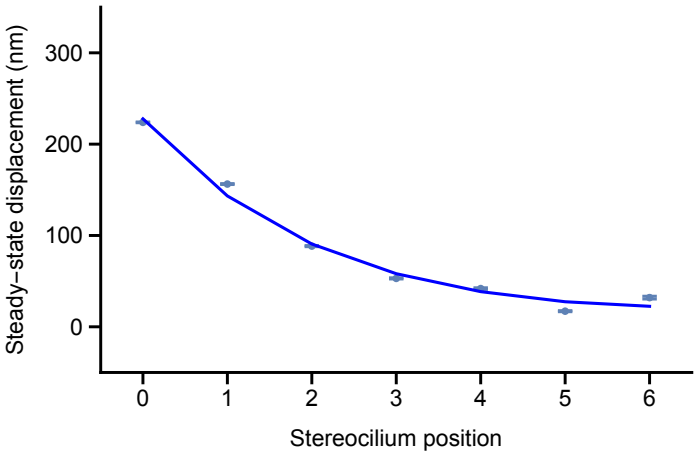
analwingindex = 29

wingindexnum = 35

S8811007_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.221985	0.00177416	125.122	6.18504	$\times 10^{-10}$
Y0ss	227.728	0.409797	555.708	3.58143	$\times 10^{-13}$

AdjustedRSquared 0.995926
AIC 1137.5
BIC 1137.34
RSquared 0.99709



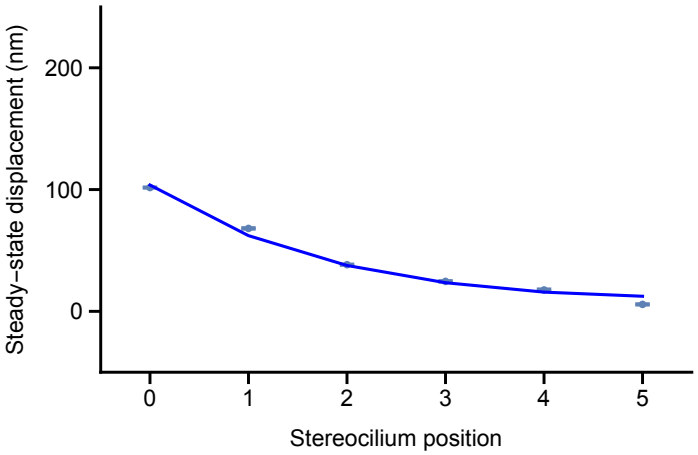
analwingindex = 30

wingindexnum = 36

S8811009_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.274105	0.00466447	58.7644	5.02177	$\times 10^{-7}$
Y0ss	103.706	0.483702	214.401	2.83909	$\times 10^{-9}$

AdjustedRSquared 0.993172
AIC 277.472
BIC 276.847
RSquared 0.995448



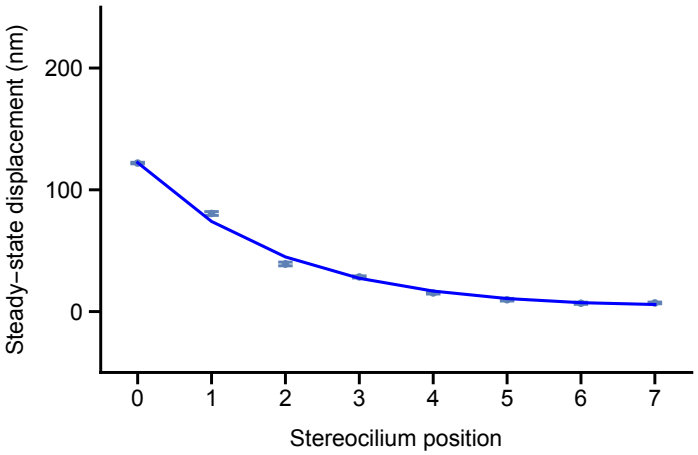
analwingindex = 31

wingindexnum = 37

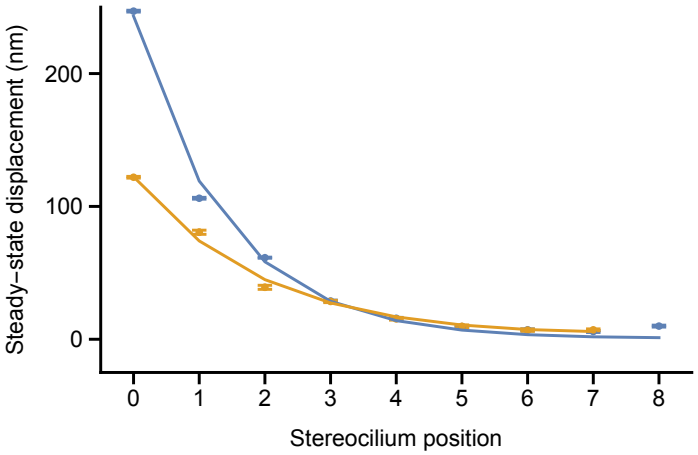
S8811019_left_1

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.258281	0.00617247	41.844	1.24624	$\times 10^{-8}$
Y0ss	122.278	0.627342	194.914	1.23046	$\times 10^{-12}$

AdjustedRSquared 0.99866
AIC 61.6965
BIC 61.9349
RSquared 0.998995


Steady−state displacement (nm)
200
100
0
0
1
2
3
4
5
6
7
Stereocilium position

In[146]:=
```
(*Example wings*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax =
  Max[Length[ssList[[wingindexnum1, 2]]], Length[ssList[[wingindexnum2, 2]]]] - 1;
Ymin = 0;
deltaY = 10^(MantissaExponent[
       Max[ssList[[wingindexnum1, 2, 1, 2]]["Value"] + ssList[[wingindexnum1, 2, 1, 2]][
          "Uncertainty"], ssList[[wingindexnum2, 2, 1, 2]]["Value"] +
         ssList[[wingindexnum2, 2, 1, 2]]["Uncertainty"]]][[2]] - 1);
Ymax = Ceiling[Max[ssList[[wingindexnum1, 2, 1, 2]]["Value"] +
     ssList[[wingindexnum1, 2, 1, 2]]["Uncertainty"], ssList[[wingindexnum2, 2, 1, 2]][
      "Value"] + ssList[[wingindexnum2, 2, 1, 2]]["Uncertainty"]], deltaY];
Linewidth = 0.005;
Fontsize = 12;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, deltaY}];
Print[Show[ListPlot[{ssList[[wingindexnum1, 2]], ssList[[wingindexnum2, 2]]},
    PlotRange → {{-0.5, Xmax + 0.5}, {-deltaY / 4, Ymax - deltaY / 2}},
    PlotStyle → Thickness[Linewidth], IntervalMarkersStyle → Thickness[Linewidth],
    Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
    FrameLabel → {"Stereocilium position", "Steady-state displacement (nm)"},
    Joined → False, FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
       {Black, Thickness[Linewidth], FontSize → Fontsize}},
      {{Black, Thickness[Linewidth], FontSize → Fontsize},
       {Black, Thickness[Linewidth], FontSize → Fontsize}}},
    Axes → False], ListPlot[{Table[{ssList[[wingindexnum1, 2, n, 1]],
       YPW[ssAoLList[[wingindexnum1, 1, 2]], n, Length[ssList[[wingindexnum1, 2]]],
        ssY0List[[wingindexnum1, 1, 2]]]}, {n, 1, Length[ssList[[wingindexnum1, 2]]]}],
     Table[{ssList[[wingindexnum2, 2, n, 1]], YPW[ssAoLList[[wingindexnum2, 1, 2]],
        n, Length[ssList[[wingindexnum2, 2]]], ssY0List[[wingindexnum2, 1, 2]]]},
      {n, 1, Length[ssList[[wingindexnum2, 2]]]}]},
    PlotStyle → Thickness[Linewidth], Joined → True]]]
ssAoLList[[wingindexnum1, 1, 2]]
ssAoLList[[wingindexnum2, 1, 2]]
ssY0List[[wingindexnum1, 1, 2]]
ssY0List[[wingindexnum2, 1, 2]]
```



Out[156]= 0.531762

Out[157]= 0.258281

Out[158]= 243.2

Out[159]= 122.278

In[160]:= (*****************Exported Data******************)

In[161]:=
```
Data[[wingindex[[wingindexnum1]], 1]]
onset = Table[{Data[[n, 3]], Data[[n, 4]]},
   {n, wingindex[[wingindexnum1]], If[wingindexnum1 + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum1 + 1]] - 1]}];
ss = Table[{Data[[n, 3]], Data[[n, 9]]},
   {n, wingindex[[wingindexnum1]], If[wingindexnum1 + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum1 + 1]] - 1]}];
ssErr = Table[{Data[[n, 3]], Data[[n, 11]] / Sqrt[Data[[n, 10]]]},
   {n, wingindex[[wingindexnum1]], If[wingindexnum1 + 1 > Length[wingindex],
     Length[Data[[All, 2]]], wingindex[[wingindexnum1 + 1]] - 1]}];
nstereo = Last[ss[[All, 1]]] + 1;
fit = NonlinearModelFit[Table[ss[[n, 2]], {n, 1, Length[ss]}],
   {YPW[AoL, m, nstereo, Y0ss]}, {AoL, {Y0ss, ss[[1, 2]]}}, m, Weights →
    Table[1 / ssErr[[n, 2]]^2, {n, 1, Length[ss]}], VarianceEstimatorFunction → (1 &)];
ssAoLList[[wingindexnum1, 1, 2]] = Evaluate[AoL /. fit["BestFitParameters"][[1]]];
ssAoLList[[wingindexnum1, 2]] = Evaluate[fit["ParameterErrors"][[1]]];
ssY0List[[wingindexnum1, 1, 2]] = Evaluate[Y0ss /. fit["BestFitParameters"][[2]]];
ssY0List[[wingindexnum1, 2]] = Evaluate[fit["ParameterErrors"][[2]]];
ssAdjRsqList[[wingindexnum1, 2]] = Evaluate[fit["AdjustedRSquared"]];
Print[Data[[wingindex[[wingindexnum1]], 1]]];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

Out[161]= S8807018_1_right

S8807018_1_right

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.531762	0.00465741	114.175	1.04242	$\times 10^{-12}$
Y0ss	243.2	0.652126	372.934	2.63201	$\times 10^{-16}$

AdjustedRSquared	0.99514
AIC	717.181
BIC	717.773
RSquared	0.99622

In[175]:=
```
Data[[wingindex[[wingindexnum2]], 1]]
onset = Table[{Data[[n, 3]], Data[[n, 4]]},
    {n, wingindex[[wingindexnum2]], If[wingindexnum2 + 1 > Length[wingindex],
      Length[Data[[All, 2]]], wingindex[[wingindexnum2 + 1]] - 1]}];
ss = Table[{Data[[n, 3]], Data[[n, 9]]},
    {n, wingindex[[wingindexnum2]], If[wingindexnum2 + 1 > Length[wingindex],
      Length[Data[[All, 2]]], wingindex[[wingindexnum2 + 1]] - 1]}];
ssErr = Table[{Data[[n, 3]], Data[[n, 11]] / Sqrt[Data[[n, 10]]]},
    {n, wingindex[[wingindexnum2]], If[wingindexnum2 + 1 > Length[wingindex],
      Length[Data[[All, 2]]], wingindex[[wingindexnum2 + 1]] - 1]}];
nstereo = Last[ss[[All, 1]]] + 1;
fit = NonlinearModelFit[Table[ss[[n, 2]], {n, 1, Length[ss]}],
    {YPW[AoL, m, nstereo, Y0ss]}, {AoL, {Y0ss, ss[[1, 2]]}}, m, Weights →
     Table[1 / ssErr[[n, 2]]^2, {n, 1, Length[ss]}], VarianceEstimatorFunction → (1 &)];
ssAoLList[[wingindexnum2, 1, 2]] = Evaluate[AoL /. fit["BestFitParameters"][[1]]];
ssAoLList[[wingindexnum2, 2]] = Evaluate[fit["ParameterErrors"][[1]]];
ssY0List[[wingindexnum2, 1, 2]] = Evaluate[Y0ss /. fit["BestFitParameters"][[2]]];
ssY0List[[wingindexnum2, 2]] = Evaluate[fit["ParameterErrors"][[2]]];
ssAdjRsqList[[wingindexnum2, 2]] = Evaluate[fit["AdjustedRSquared"]];
Print[Data[[wingindex[[wingindexnum2]], 1]]];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

Out[175]=
```
S8811019_1_left
```

S8811019_1_left

	Estimate	Standard Error	t-Statistic	P-Value	
AoL	0.258281	0.00617247	41.844	1.24624	$\times 10^{-8}$
Y0ss	122.278	0.627342	194.914	1.23046	$\times 10^{-12}$

```
AdjustedRSquared 0.99866
AIC              61.6965
BIC              61.9349
RSquared         0.998995
```

In[189]:=
```
(*Remove NaN entries*)
baddata[entry_] := MatchQ[entry, {{_?NumberQ, NaN}, NaN}];
ssnstereoListrenum = DeleteCases[ssnstereoList, NaN];
ssAoLListtemp = DeleteCases[ssAoLList, _?baddata];
ssAoLListrenum = Table[{{n, ssAoLListtemp[[n, 1, 2]]}, ssAoLListtemp[[n, 2]]},
    {n, 1, Length[ssAoLListtemp]}];
baddata2[entry_] := MatchQ[entry, {_?NumberQ, NaN}];
ssAdjRsqListtemp = DeleteCases[ssAdjRsqList, _?baddata2];
ssAdjRsqListrenum =
  Table[{{n, ssAdjRsqListtemp[[n, 2]]}}, {n, 1, Length[ssAdjRsqListtemp]}];
```

In[196]:=
```
(*Minimum and maximum ratios*)
Min[ssAoLListrenum[[All, 1, 2]]]
Max[ssAoLListrenum[[All, 1, 2]]]
```

Out[196]= 0.154369

Out[197]= 0.531762

In[198]:=
```
MedianSSAoL = Quantile[ssAoLListrenum[[All, 1, 2]], 0.5]
LowerQuantileSSAoL = Quantile[ssAoLListrenum[[All, 1, 2]], 0.25]
UpperQuantileSSAoL = Quantile[ssAoLListrenum[[All, 1, 2]], 0.75]
```

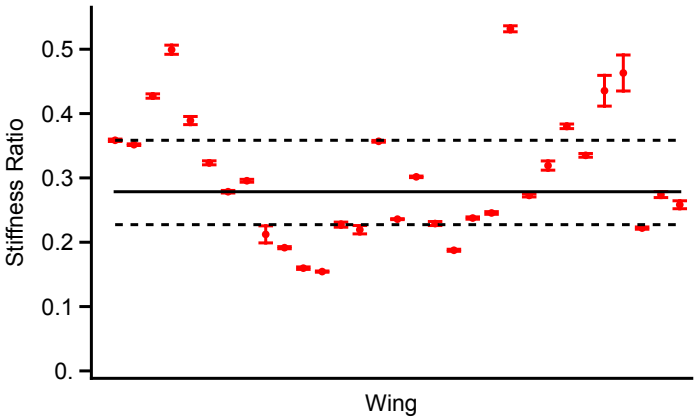
Out[198]= 0.278512

Out[199]= 0.227344

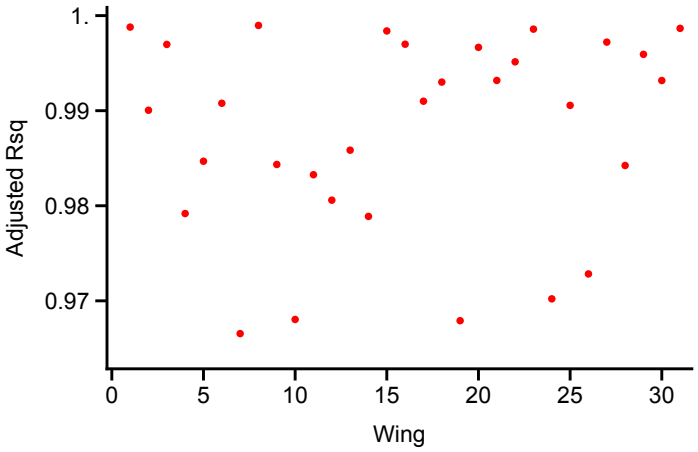
Out[200]= 0.358482

In[201]:=
```
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = Length[ssAoLListrenum];
Ymin = 0; Ymax = 1;
Linewidth = 0.005;
Fontsize = 12;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 5}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 0.1}];
Show[ListPlot[Table[
    {ssAoLListrenum[[n, 1, 1]], Around[ssAoLListrenum[[n, 1, 2]], ssAoLListrenum[[n, 2]]]},
    {n, 1, Length[ssAoLListrenum]}],
  PlotRange → All, PlotStyle → {Thickness[Linewidth], Red},
  IntervalMarkersStyle → {Thickness[Linewidth], Red},
  Frame → {{True, False}, {True, False}}, FrameTicks → {None, YTicks},
  FrameLabel → {"Wing", "Stiffness Ratio"}, Joined → False,
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 Plot[{MedianSSAoL, LowerQuantileSSAoL, UpperQuantileSSAoL},
  {n, 1, Length[ssAoLListrenum]}, PlotStyle → {{Thickness[Linewidth], Black},
    {Thickness[Linewidth], Black, Dashed}, {Thickness[Linewidth], Black, Dashed}}]]
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = Length[ssAoLListrenum];
Ymin = 0;
Ymax = 1;
Linewidth = 0.005;
Fontsize = 12;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 5}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 0.01}];
ListPlot[Table[{ssAoLListrenum[[n, 1, 1]], ssAdjRsqListrenum[[n, 1, 2]]},
  {n, 1, Length[ssAoLListrenum]}],
 PlotRange → All, PlotStyle → {Thickness[Linewidth], Red},
 IntervalMarkersStyle → Thickness[Linewidth], Frame → {{True, False}, {True, False}},
 FrameTicks → {XTicks, YTicks}, FrameLabel → {"Wing", "Adjusted Rsq"},
 Joined → False, FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}},
   {{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]
```

Out[209]=



Out[219]=



In[220]:=
```
(*Minimum adjRsq*)
Min[ssAdjRsqList[[All, 2]]]
```

Out[220]=
```
Min[0.966551, NaN]
```

In[221]:=
```
(*Maximum P-value over all fit parameters*)
Max[{ssAoLPvalList[[All, 2]], ssY0PvalList[[All, 2]]}]
```

Out[221]=
```
Max[0.0000146837, NaN]
```

In[222]:=
```
SEList = DeleteCases[Table[onsetAoLList[[n, 2]], {n, 1, Length[wingindex]}], NaN];
onsetAoLList2 = DeleteCases[onsetAoLList[[All, 1, 2]], NaN];
gammaAoLave = Sum[onsetAoLList2[[n]] / SEList[[n]]^2, {n, 1, Length[onsetAoLList2]}] /
  Sum[1 / SEList[[n]]^2, {n, 1, Length[onsetAoLList2]}]
(*SE in the weighted mean*)
Sqrt[1 / Sum[1 / SEList[[n]]^2, {n, 1, Length[onsetAoLList2]}]]
(*Fraction of wings above the mean => distribution is not symmetric*)
N[Sum[If[onsetAoLList2[[n]] > gammaAoLave, 1, 0], {n, 1, Length[onsetAoLList2]}] /
  Length[onsetAoLList2]]
```

Out[224]= 0.179818

Out[225]= 0.000559756

Out[226]= 0.677419

In[227]:=
```
(*Average KA/KL with SE. Weighted mean, more weight when SE is smaller*)
SEList = DeleteCases[Table[ssAoLList[[n, 2]], {n, 1, Length[wingindex]}], NaN];
ssAoLList2 = DeleteCases[ssAoLList[[All, 1, 2]], NaN];
KAoLave = Sum[ssAoLList2[[n]] / SEList[[n]]^2, {n, 1, Length[ssAoLList2]}] /
  Sum[1 / SEList[[n]]^2, {n, 1, Length[ssAoLList2]}]
(*SE in the weighted mean*)
Sqrt[1 / Sum[1 / SEList[[n]]^2, {n, 1, Length[ssAoLList2]}]]
(*Fraction of wings above the mean => distribution is not symmetric*)
N[Sum[If[ssAoLList2[[n]] > KAoLave, 1, 0], {n, 1, Length[ssAoLList2]}] /
  Length[ssAoLList2]]
```

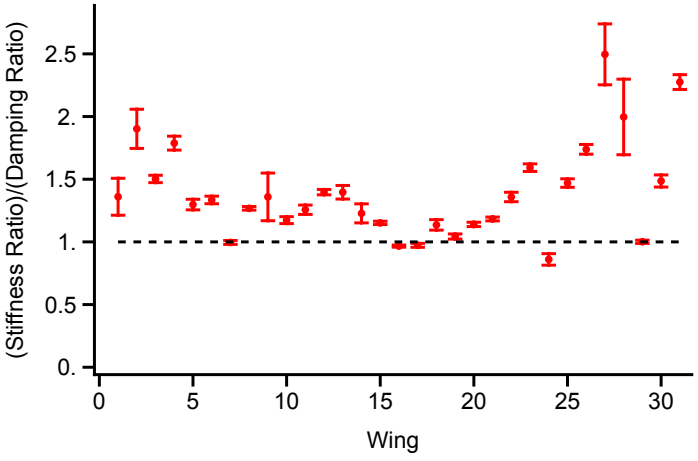
Out[229]= 0.256637

Out[230]= 0.0003463

Out[231]= 0.612903

In[232]:=
```
(*Predicts which wings overshoot for an ideal step stimulus (Ratio/Ratio > 1),
but expt step is not ideal and probe drifts after onset.*)
RatioErr = Table[Abs[(ssAoLListrenum[[n, 1, 2]] / onsetAoLListrenum[[n, 1, 2]]) *
      Sqrt[(onsetAoLListrenum[[n, 2]] / onsetAoLListrenum[[n, 1, 2]])^2 +
        (ssAoLListrenum[[n, 2]] / ssAoLListrenum[[n, 1, 2]])^2]],
   {n, 1, Length[ssAoLListrenum]}];
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = Length[ssAoLListrenum];
Ymin = 0;
Ymax = 5;
Linewidth = 0.005;
Fontsize = 12;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 5}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 0.5}];
Show[ListPlot[Table[
   {n, Around[ssAoLListrenum[[n, 1, 2]] / onsetAoLListrenum[[n, 1, 2]], RatioErr[[n]]]},
   {n, 1, Length[ssAoLListrenum]}],
  PlotRange → All, PlotStyle → {Thickness[Linewidth], Red},
  IntervalMarkersStyle → {Thickness[Linewidth], Red},
  Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Wing", "(Stiffness Ratio)/(Damping Ratio)"}, Joined → False,
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}},
  Axes → False], Plot[1, {n, 1, Length[ssAoLListrenum]},
  PlotStyle → {{Thickness[Linewidth], Black, Dashed}}]]
```

Out[242]=



In[243]:=
```
(*4 of 31 have ssAoL < onsetAoL => no overshoot for ideal step*)
Sum[{{ssAoLListrenum[[n, 1, 2]] / onsetAoLListrenum[[n, 1, 2]] < 1}},
 {n, 1, Length[ssAoLListrenum]}]
Table[{{n, ssAoLListrenum[[n, 1, 2]] / onsetAoLListrenum[[n, 1, 2]]}},
 {n, 1, Length[ssAoLListrenum]}]
```

Out[243]=
```
{{27 False + 4 True}}
```

Out[244]=
```
{{{1, 1.36016}}, {{2, 1.90209}}, {{3, 1.50212}}, {{4, 1.7878}}, {{5, 1.29781}},
 {{6, 1.33456}}, {{7, 0.995628}}, {{8, 1.26779}}, {{9, 1.35907}}, {{10, 1.1736}},
 {{11, 1.25649}}, {{12, 1.39694}}, {{13, 1.39599}}, {{14, 1.22753}}, {{15, 1.15155}},
 {{16, 0.966437}}, {{17, 0.972563}}, {{18, 1.13574}}, {{19, 1.04282}},
 {{20, 1.13948}}, {{21, 1.18289}}, {{22, 1.35828}}, {{23, 1.59226}},
 {{24, 0.860208}}, {{25, 1.46942}}, {{26, 1.73847}}, {{27, 2.49625}},
 {{28, 1.99679}}, {{29, 1.00086}}, {{30, 1.48588}}, {{31, 2.27514}}}
```

In[245]:=
```
(*Number of wings with KAoL > gammaAoL => Get overshoot for step stimulus.*)
Length[Cases[Table[ssAoLList[[n, 1, 2]] / onsetAoLList[[n, 1, 2]],
   {n, 1, Length[wingindex]}], x_ /; x > 1]]
```

Out[245]=
```
27
```

In[246]:=
```
(*Weighted mean of RatioRatio, more weight when SE is smaller*)
RatioRatioList = DeleteCases[
   Table[ssAoLList[[n, 1, 2]] / onsetAoLList[[n, 1, 2]], {n, 1, Length[wingindex]}], NaN];
SERatioRatioList = DeleteCases[Table[(ssAoLList[[n, 1, 2]] / onsetAoLList[[n, 1, 2]]) *
     Sqrt[(ssAoLList[[n, 2]] / ssAoLList[[n, 1, 2]])^2 +
        (onsetAoLList[[n, 2]] / onsetAoLList[[n, 1, 2]])^2],
    {n, 1, Length[wingindex]}], NaN];
wmean =
 Sum[RatioRatioList[[n]] / SERatioRatioList[[n]]^2, {n, 1, Length[RatioRatioList]}] /
  Sum[1 / SERatioRatioList[[n]]^2, {n, 1, Length[RatioRatioList]}]
(*SE in the weighted mean*)
sewmean = Sqrt[1 / Sum[1 / SERatioRatioList[[n]]^2, {n, 1, Length[RatioRatioList]}]]
```

Out[248]=
```
1.13437
```

Out[249]=
```
0.00403623
```

In[250]:=
```
Length[RatioRatioList]
```

Out[250]=
```
31
```

In[251]:=
```
(*Means don't give the full picture, because distributions are not symmetric*)
(*Ave[KAoL/gammaAoL] < Ave[KAoL]/Ave[gammaAoL]*)
wmean
KAoLave / gammaAoLave
(*Fraction of wings above the mean*)
N[Sum[If[RatioRatioList[[n]] > wmean, 1, 0], {n, 1, Length[RatioRatioList]}] /
  Length[RatioRatioList]]
```

Out[251]= 1.13437

Out[252]= 1.42721

Out[253]= 0.806452

In[254]:=
```
(*Median is better for non-symmetric data*)
gammaAoLmedian = Median[onsetAoLList2]
KAoLmedian = Median[ssAoLList2]
KAoLOgammaAoLmedian = Median[RatioRatioList]
(*Fraction of wings above the median of ratios*)
N[Sum[If[RatioRatioList[[n]] > KAoLOgammaAoLmedian, 1, 0],
   {n, 1, Length[RatioRatioList]}] / Length[RatioRatioList]]
```

Out[254]= 0.208526

Out[255]= 0.278512

Out[256]= 1.33456

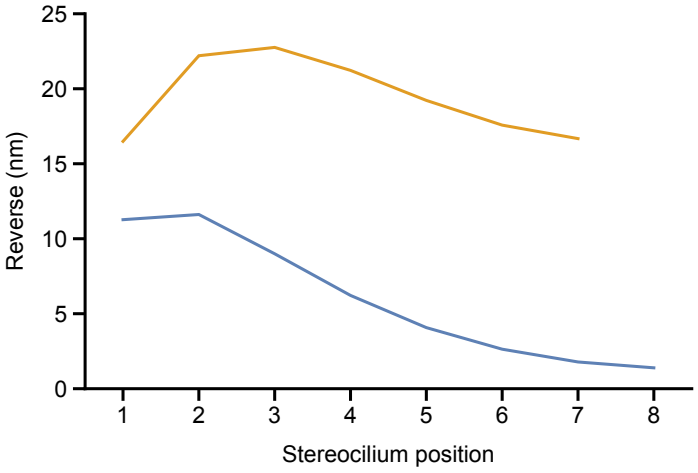
Out[257]= 0.483871

In[258]:=
```
(*Reversal for ideal step using fit values. Use Y0 from onset*)
(*Example wings*)
wingindexnum1 = 28;
wingindexnum2 = 37;
(*Reversal = Peak - Steady-state*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 1;
Xmax =
  Max[Length[ssList[[wingindexnum1, 2]]], Length[ssList[[wingindexnum2, 2]]]] - 1;
Ymin = 0;
deltaY = 5;
Ymax = 25;
Linewidth = 0.005;
Fontsize = 12;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, deltaY}];
Show[ListPlot[
  {Table[{ssList[[wingindexnum1, 2, n, 1]], YPW[onsetAoLList[[wingindexnum1, 1, 2]], n,
```

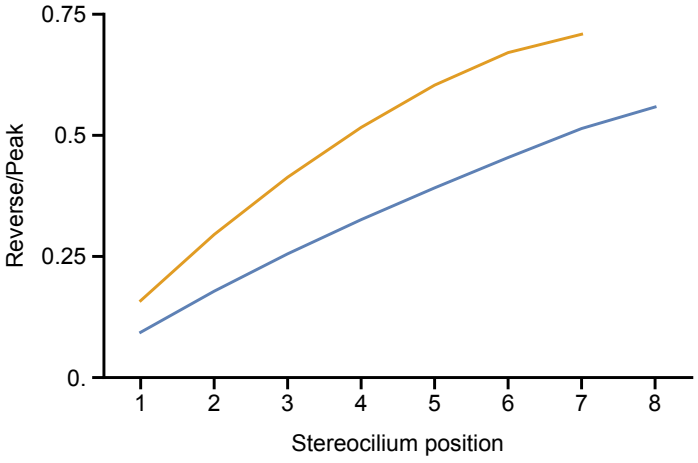
```
        Length[onsetList[[wingindexnum1, 2]]], onsetY0List[[wingindexnum1, 1, 2]]] -
       YPW[ssAoLList[[wingindexnum1, 1, 2]], n, Length[ssList[[wingindexnum1, 2]]],
        onsetY0List[[wingindexnum1, 1, 2]]]},
     {n, 2, Length[ssList[[wingindexnum1, 2]]]}], Table[{ssList[[wingindexnum2, 2, n, 1]],
      YPW[onsetAoLList[[wingindexnum2, 1, 2]], n, Length[onsetList[[wingindexnum2, 2]]],
        onsetY0List[[wingindexnum2, 1, 2]]] - YPW[ssAoLList[[wingindexnum2, 1, 2]],
        n, Length[ssList[[wingindexnum2, 2]]], onsetY0List[[wingindexnum2, 1, 2]]]},
     {n, 2, Length[ssList[[wingindexnum2, 2]]]}]]},
  PlotRange → {{Xmin - 0.5, Xmax + 0.5}, {0, Ymax}},
  PlotStyle → Thickness[Linewidth],
  IntervalMarkersStyle → Thickness[Linewidth],
  Frame → {{True, False}, {True, False}},
  FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Stereocilium position", "Reverse (nm)"},
  Joined → True,
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
(*Reversal/Peak = 1 - Steady-state/Peak*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 1;
Xmax =
  Max[Length[ssList[[wingindexnum1, 2]]], Length[ssList[[wingindexnum2, 2]]]] - 1;
Ymin = 0;
deltaY = 0.25;
Ymax = 0.75;
Linewidth = 0.005;
Fontsize = 12;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, deltaY}];
Show[ListPlot[{Table[{ssList[[wingindexnum1, 2, n, 1]],
     1 - YPW[ssAoLList[[wingindexnum1, 1, 2]], n, Length[ssList[[wingindexnum1, 2]]],
       onsetY0List[[wingindexnum1, 1, 2]]] / YPW[onsetAoLList[[wingindexnum1, 1, 2]],
       n, Length[onsetList[[wingindexnum1, 2]]], onsetY0List[[wingindexnum1, 1, 2]]]},
    {n, 2, Length[ssList[[wingindexnum1, 2]]]}], Table[{ssList[[wingindexnum2, 2, n, 1]],
     1 - YPW[ssAoLList[[wingindexnum2, 1, 2]], n, Length[ssList[[wingindexnum2, 2]]],
       onsetY0List[[wingindexnum2, 1, 2]]] / YPW[onsetAoLList[[wingindexnum2, 1, 2]],
       n, Length[onsetList[[wingindexnum2, 2]]], onsetY0List[[wingindexnum2, 1, 2]]]},
    {n, 2, Length[ssList[[wingindexnum2, 2]]]}]}], PlotRange →
   {{Xmin - 0.5, Xmax + 0.5}, {0, Ymax}},
  PlotStyle → Thickness[Linewidth],
  IntervalMarkersStyle →
```

```
   Thickness[Linewidth],
  Frame → {{True, False}, {True, False}},
  FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Stereocilium position", "Reverse/Peak"},
  Joined → True,
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
ssAoLList[[wingindexnum1, 1, 2]]
ssAoLList[[wingindexnum2, 1, 2]]
onsetAoLList[[wingindexnum1, 1, 2]]
onsetAoLList[[wingindexnum2, 1, 2]]
ssY0List[[wingindexnum1, 1, 2]]
onsetY0List[[wingindexnum1, 1, 2]]
ssY0List[[wingindexnum2, 1, 2]]
onsetY0List[[wingindexnum2, 1, 2]]
```

Out[270]=



Out[281]=



Out[282]= 0.531762

Out[283]= 0.258281

Out[284]= 0.391498

Out[285]= 0.113523

Out[286]= 243.2

Out[287]= 223.285

Out[288]= 122.278

Out[289]= 144.43

In[290]:=
```
ntotv = ssnstereoList[[wingindexnum1]];
KAoLv = ssAoLList[[wingindexnum1, 1, 2]];
gammaAoLv = onsetAoLList[[wingindexnum1, 1, 2]];
KAoLv / gammaAoLv
Y0v = 500;(*nm*)
```

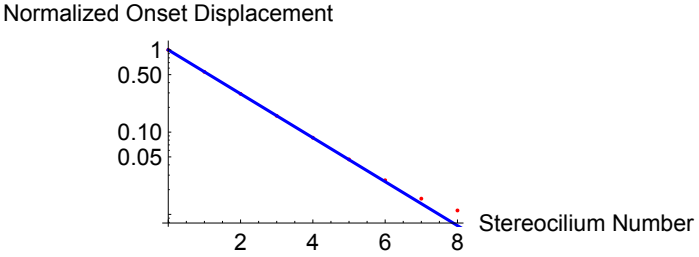
Out[293]= 1.35828

In[295]:=
```
(*Onset decay can be fit by an exponential. Deviates
 from exponential at stereocilium numbers close to ntot*)
fit = NonlinearModelFit[Table[{n, Y[n, ntotv, gammaAoLv, Y0v] / Y0v}, {n, 0, ntotv - 1}],
   {Exp[m / ndec]}, {{ndec, -1}}, m];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
Show[ListLogPlot[
  Table[{n, Y[n, ntotv, gammaAoLv, Y0v] / Y0v}, {n, 0, ntotv - 1}], PlotStyle → Red,
  AxesLabel → {"Stereocilium Number", "Normalized Onset Displacement"},
  AxesStyle → Directive[Black, FontSize → 12]],
 ListLogPlot[Table[{n, Exp[n / (ndec /. fit["BestFitParameters"])]}, {n, 0, ntotv}],
  PlotStyle → Blue, Joined → True]]
(*Absolute error between exact solution and exponential fit*)
ListLogPlot[Table[{n, Abs[
    Y[n, ntotv, gammaAoLv, Y0v] / Y0v - Exp[n / (ndec /. fit["BestFitParameters"])]]},
  {n, 0, ntotv - 1}], PlotStyle → Blue, Joined → True,
 AxesLabel → {"Stereocilium Number", "Error"},
 AxesStyle → Directive[Black, FontSize → 12, PlotRange → All]]
```

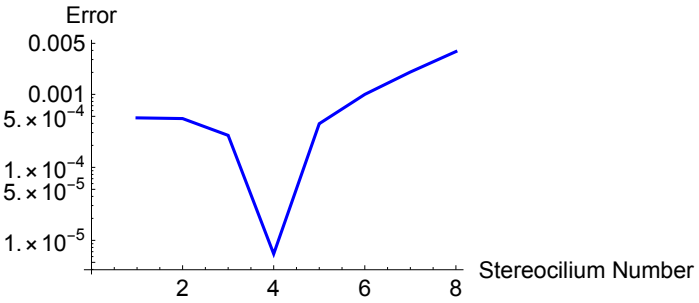
	Estimate	Standard Error	t-Statistic	P-Value
ndec	−1.62611	0.00411952	−394.732	1.89986×10^{-18}

```
AdjustedRSquared 0.999984
AIC              -87.261
BIC              -86.8665
RSquared         0.999985
```

Out[298]=



Out[299]=



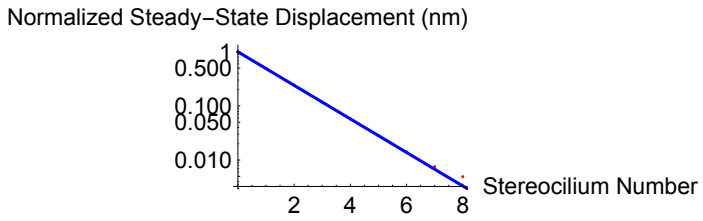
In[300]:=

```
(*ss decay can be fit by an exponential. Deviates
 from exponential at stereocilium numbers close to ntot*)
fit = NonlinearModelFit[Table[{n, Y[n, ntotv, KAoLv, Y0v] / Y0v}, {n, 0, ntotv - 1}],
    {Exp[m / ndec]}, {{ndec, -1}}, m];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
Show[ListLogPlot[
  Table[{n, Y[n, ntotv, KAoLv, Y0v] / Y0v}, {n, 0, ntotv - 1}], PlotStyle → Red,
  AxesLabel → {"Stereocilium Number", "Normalized Steady-State Displacement (nm)"},
  AxesStyle → Directive[Black, FontSize → 12]],
 ListLogPlot[Table[{n, Exp[n / (ndec /. fit["BestFitParameters"])]}, {n, 0, ntotv}],
  PlotStyle → Blue, Joined → True]]
(*Absolute error between exact solution and exponential fit*)ListLogPlot[Table[
  {n, Abs[Y[n, ntotv, KAoLv, Y0v] / Y0v - Exp[n / (ndec /. fit["BestFitParameters"])]]},
  {n, 0, ntotv - 1}], PlotStyle → Blue, Joined → True,
 AxesLabel → {"Stereocilium Number", "Error"},
 AxesStyle → Directive[Black, FontSize → 12]]
```

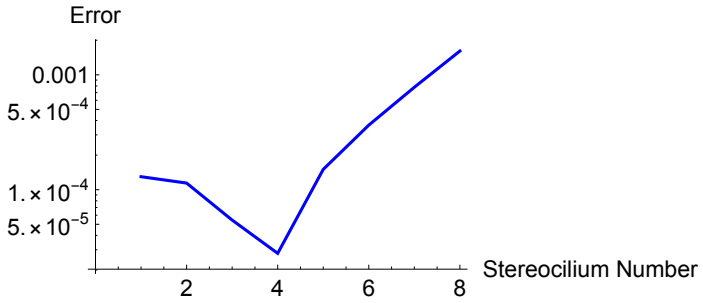
	Estimate	Standard Error	t-Statistic	P-Value
ndec	−1.40119	0.00155432	−901.483	2.56768×10^{-21}

```
AdjustedRSquared 0.999997
AIC              -103.511
BIC              -103.116
RSquared         0.999997
```

Out[303]=

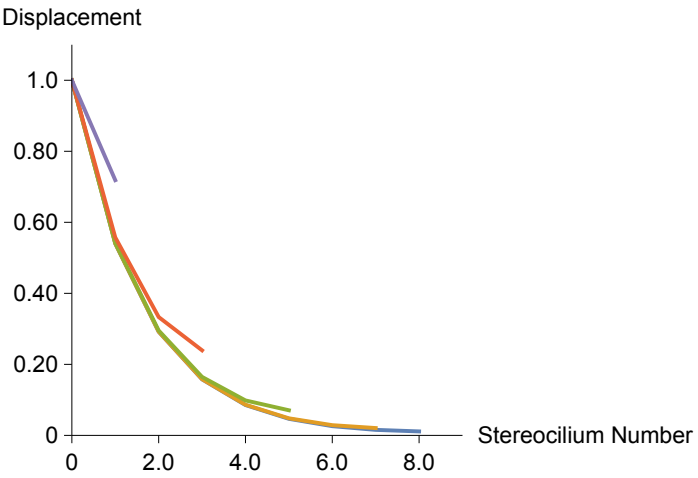


Out[304]=

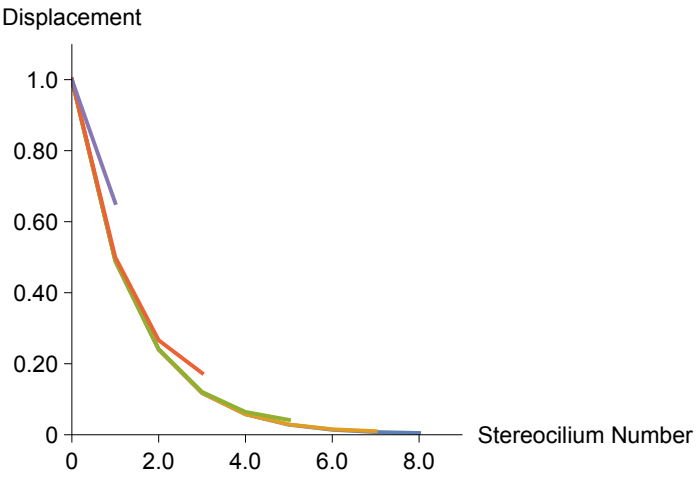


In[305]:=
```
(*Note that the onset and ss decays depend on
 the total number of stereocilia even when normalized*)
Y0v = 500;
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = ntotv;
Ymin = 0;
Ymax = 1.1;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 2 * 10^0}];
YTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Ymin, Ymax, 2 * 10^-1}];
(*Onset*)
ListPlot[{Table[{n, Y[n, ntotv, gammaAoLv, Y0v] / Y0v}, {n, 0, ntotv - 1}],
  Table[{n, Y[n, 8, gammaAoLv, Y0v] / Y0v}, {n, 0, 8 - 1}],
  Table[{n, Y[n, 6, gammaAoLv, Y0v] / Y0v}, {n, 0, 6 - 1}],
  Table[{n, Y[n, 4, gammaAoLv, Y0v] / Y0v}, {n, 0, 4 - 1}],
  Table[{n, Y[n, 2, gammaAoLv, Y0v] / Y0v}, {n, 0, 2 - 1}]}, AspectRatio → 1,
 PlotRange → {{0, ntotv}, {0, 1.1}}, PlotStyle → Thickness[0.01],
 AxesLabel → {"Stereocilium Number", "Displacement"},
 AxesStyle → Directive[Black, FontSize → 12], Ticks → {XTicks, YTicks},
 Method → {"AxesInFront" → False}, Joined → True]
(*ss*)
ListPlot[{Table[{n, Y[n, ntotv, KAoLv, Y0v] / Y0v}, {n, 0, ntotv - 1}],
  Table[{n, Y[n, 8, KAoLv, Y0v] / Y0v}, {n, 0, 8 - 1}],
  Table[{n, Y[n, 6, KAoLv, Y0v] / Y0v}, {n, 0, 6 - 1}],
  Table[{n, Y[n, 4, KAoLv, Y0v] / Y0v}, {n, 0, 4 - 1}],
  Table[{n, Y[n, 2, KAoLv, Y0v] / Y0v}, {n, 0, 2 - 1}]}, AspectRatio → 1,
 PlotRange → {{0, ntotv}, {0, 1.1}}, PlotStyle → Thickness[0.01],
 AxesLabel → {"Stereocilium Number", "Displacement"},
 AxesStyle → Directive[Black, FontSize → 12], Ticks → {XTicks, YTicks},
 Method → {"AxesInFront" → False}, Joined → True]
```

Out[313]=



Out[314]=



In[315]:=
```
(***************)
(*Simulate Step Stimulus*)
(***************)
```

In[316]:=
```
(*Slope of the stimulus onset used heres. s/4 is the maximum slope.*)
slopef[t_, tS_, s_] := Evaluate[D[(1 + Exp[-(t - tS) * s])^-1, t]]
slopef[t, tS, s]
(*Find time of maximum slope*)
Dslopef[t_, tS_, s_] := Evaluate[D[slopef[t, tS, s], t]]
Solve[Dslopef[t, tS, s] == 0, t, Reals]
(*Maximum slope*)
slopef[tS, tS, s]
```

Out[317]=
$$\frac{e^{s\,(-t+tS)}\,s}{\left(1+e^{s\,(-t+tS)}\right)^2}$$

Out[319]=
$$\{\{t \to tS\}\}$$

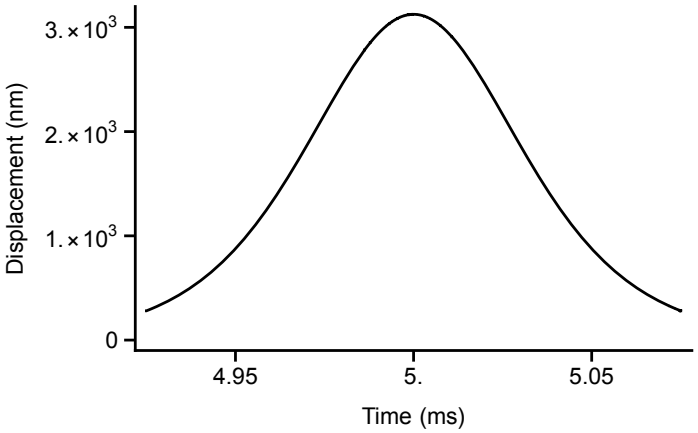
Out[320]=
$$\frac{s}{4}$$

In[321]:=
```
(***************)
(*wingindexnum2*)
(***************)
```

In[322]:=
```
(*Match slope of stimulus to experimental data*)
ntotv = ssnstereoList[[wingindexnum2]]
Y0v = 250 (*nm*);
slopefac = 50;
ts = 5;
te = 55;
trange = 60;
Y0f[t_] :=
  Y0v * Evaluate[(1 + Exp[-(t - ts) * slopefac])^-1 - (1 + Exp[-(t - te) * slopefac])^-1];
(*Tick Marks*)
TickLength = 0.02;
Xmin = ts - 0.1;
Xmax = ts + 0.1;
Ymin = 0;
Ymax = 5 * 10^3;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 5 * 10^-2}];
YTicks = Table[{i, N[i, 1], {0, TickLength}}, {i, Ymin, Ymax, 10^3}];
Show[Plot[{Y0f'[t]}, {t, ts - 0.075, ts + 0.075}, PlotRange → {-100, 3.2 * 10^3},
  MaxRecursion → 15, PlotStyle → {Black, Thickness[Linewidth]},
  Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
```

Out[322]= 8

Out[336]=



In[337]:=
```
(*Doesn't work unless we use the equation simplification method*)
(*8 cilia, Y0 clamped, all cilia have rootlets. For 10 kHz low-
  pass filtered experimental stimulus use s =
 10*4 = 40 such that the maximum slope is 5 kHz.*)
KLv = 5;(*mN/m*)
```

```
KAv = ssAoLList[[wingindexnum2, 1, 2]] * KLv;
gammaLv = 0.8 * KLv;(*uN.s/m*)
gammaLv / KLv(*ms*)
gammaAv = onsetAoLList[[wingindexnum2, 1, 2]] * gammaLv;
KAoLv = KAv / KLv;
gammaAoLv = gammaAv / gammaLv;
(*Geometric mean time constant*)
taugmv = (gammaLv / KLv) *
  (g[ntotv - 1, gammaAoLv, 1] / g[ntotv - 1, KAv / KLv, 1]) ^ (1 / (ntotv - 1))
KA1v = KAv; gammaA1v = gammaAv;
KA2v = KAv; gammaA2v = gammaAv;
KA3v = KAv; gammaA3v = gammaAv;
KA4v = KAv; gammaA4v = gammaAv;
KA5v = KAv; gammaA5v = gammaAv;
KA6v = KAv; gammaA6v = gammaAv;
KA7v = KAv; gammaA7v = gammaAv;
K1v = KLv; gamma1v = gammaLv;
K2v = KLv; gamma2v = gammaLv;
K3v = KLv; gamma3v = gammaLv;
K4v = KLv; gamma4v = gammaLv;
K5v = KLv; gamma5v = gammaLv;
K6v = KLv; gamma6v = gammaLv;
K7v = KLv; gamma7v = gammaLv;
Ysln =
 NDSolve[{KA1v * Y1[t] + gammaA1v * Y1'[t] + K1v * (Y1[t] - Y0f[t]) - K2v * (Y2[t] - Y1[t]) +
     gamma1v * (Y1'[t] - Y0f'[t]) - gamma2v * (Y2'[t] - Y1'[t]) == 0, Y1[0] == 0,
   KA2v * Y2[t] + gammaA2v * Y2'[t] + K2v * (Y2[t] - Y1[t]) - K3v * (Y3[t] - Y2[t]) +
     gamma2v * (Y2'[t] - Y1'[t]) - gamma3v * (Y3'[t] - Y2'[t]) == 0, Y2[0] == 0,
   KA3v * Y3[t] + gammaA3v * Y3'[t] + K3v * (Y3[t] - Y2[t]) - K4v * (Y4[t] - Y3[t]) +
     gamma3v * (Y3'[t] - Y2'[t]) - gamma4v * (Y4'[t] - Y3'[t]) == 0, Y3[0] == 0,
   KA4v * Y4[t] + gammaA4v * Y4'[t] + K4v * (Y4[t] - Y3[t]) - K5v * (Y5[t] - Y4[t]) +
     gamma4v * (Y4'[t] - Y3'[t]) - gamma5v * (Y5'[t] - Y4'[t]) == 0, Y4[0] == 0,
   KA5v * Y5[t] + gammaA5v * Y5'[t] + K5v * (Y5[t] - Y4[t]) - K6v * (Y6[t] - Y5[t]) +
     gamma5v * (Y5'[t] - Y4'[t]) - gamma6v * (Y6'[t] - Y5'[t]) == 0, Y5[0] == 0,
   KA6v * Y6[t] + gammaA6v * Y6'[t] + K6v * (Y6[t] - Y5[t]) - K7v * (Y7[t] - Y6[t]) +
     gamma6v * (Y6'[t] - Y5'[t]) - gamma7v * (Y7'[t] - Y6'[t]) == 0, Y6[0] == 0,
   KA7v * Y7[t] + gammaA7v * Y7'[t] + K7v * (Y7[t] - Y6[t]) + gamma7v * (Y7'[t] - Y6'[t]) ==
    0, Y7[0] == 0}, {Y1, Y2, Y3, Y4, Y5, Y6, Y7},
  {t, 0, trange}, Method → {"EquationSimplification" → "Residual"}]
Y1f[t_] := Evaluate[Y1[t] /. Ysln[[1]]]
Y2f[t_] := Evaluate[Y2[t] /. Ysln[[1]]]
Y3f[t_] := Evaluate[Y3[t] /. Ysln[[1]]]
Y4f[t_] := Evaluate[Y4[t] /. Ysln[[1]]]
Y5f[t_] := Evaluate[Y5[t] /. Ysln[[1]]]
```

```
Y6f[t_] := Evaluate[Y6[t] /. Ysln[[1]]]
Y7f[t_] := Evaluate[Y7[t] /. Ysln[[1]]]
(*Stimulus and responses*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = trange;
Ymin = 0;
Ymax = 250;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 1 * 10^1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 5 * 10^1}];
Show[Plot[{Y0f[t]}, {t, 0, trange}, PlotRange → {Ymin - 15, Ymax + 15},
  MaxRecursion → 15, PlotStyle → {Black, Thickness[Linewidth]},
  Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 Plot[{Y7f[t], Y6f[t], Y5f[t], Y4f[t], Y3f[t], Y2f[t], Y1f[t]},
  {t, 0, trange}, MaxRecursion → 15, PlotStyle → Thickness[Linewidth],
  Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
(*Decay rates are different.*)
Y1peak = Evaluate[NMaximize[{Y1f[t], t < trange / 2, t > 0}, t][[1]];
t1peak = Evaluate[t /. NMaximize[{Y1f[t], t < trange / 2, t > 0}, t][[2]];
Y2peak = Evaluate[NMaximize[{Y2f[t], t < trange / 2, t > 0}, t][[1]];
t2peak = Evaluate[t /. NMaximize[{Y2f[t], t < trange / 2, t > 0}, t][[2]];
Y3peak = Evaluate[NMaximize[{Y3f[t], t < trange / 2, t > 0}, t][[1]];
t3peak = Evaluate[t /. NMaximize[{Y3f[t], t < trange / 2, t > 0}, t][[2]];
Y4peak = Evaluate[NMaximize[{Y4f[t], t < trange / 2, t > 0}, t][[1]];
t4peak = Evaluate[t /. NMaximize[{Y4f[t], t < trange / 2, t > 0}, t][[2]];
Y5peak = Evaluate[NMaximize[{Y5f[t], t < trange / 2, t > 0}, t][[1]];
t5peak = Evaluate[t /. NMaximize[{Y5f[t], t < trange / 2, t > 0}, t][[2]];
Y6peak = Evaluate[NMaximize[{Y6f[t], t < trange / 2, t > 0}, t][[1]];
t6peak = Evaluate[t /. NMaximize[{Y6f[t], t < trange / 2, t > 0}, t][[2]];
Y7peak = Evaluate[NMaximize[{Y7f[t], t < trange / 2, t > 0}, t][[1]];
t7peak = Evaluate[t /. NMaximize[{Y7f[t], t < trange / 2, t > 0}, t][[2]];
(*Stereocilium 7 response*)
(*Tick Marks*)
```

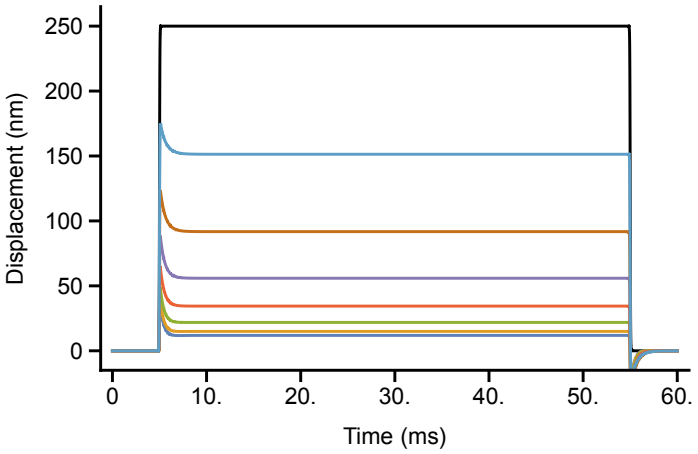
```
TickLength = 0.02;
Xmin = 0;
Xmax = trange;
Ymin = -50;
Ymax = 50;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 1 * 10^1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 1 * 10^1}];
stereocilium1symmplot =
 Show[Plot[{Y7f[t]}, {t, 0, trange}, PlotRange → All, MaxRecursion → 15,
   PlotStyle → Thickness[Linewidth], Frame → {{True, False}, {True, False}},
   FrameTicks → {XTicks, YTicks}, FrameLabel → {"Time (ms)", "Displacement (nm)"},
   FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
       {Black, Thickness[Linewidth], FontSize → Fontsize}},
     {{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
(*Zoom for onset time*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = ts + 3;
Ymin = 0;
Ymax = 300;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1 * 10^0}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 1 * 10^2}];
Show[Plot[{Y0f[t]}, {t, ts - 1, ts + 2},
  PlotRange → {Ymin - 10, Ymax}, MaxRecursion → 15,
  PlotStyle → {Black, Thickness[Linewidth]}, Frame → {{True, False}, {True, False}},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 Plot[{Y7f[t], Y6f[t], Y5f[t], Y4f[t], Y3f[t], Y2f[t], Y1f[t]},
  {t, ts - 1, ts + 2}, PlotRange → All, MaxRecursion → 15,
  PlotStyle → {Thickness[Linewidth]}, Frame → {{True, False}, {True, False}},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
```

Out[340]= 0.8

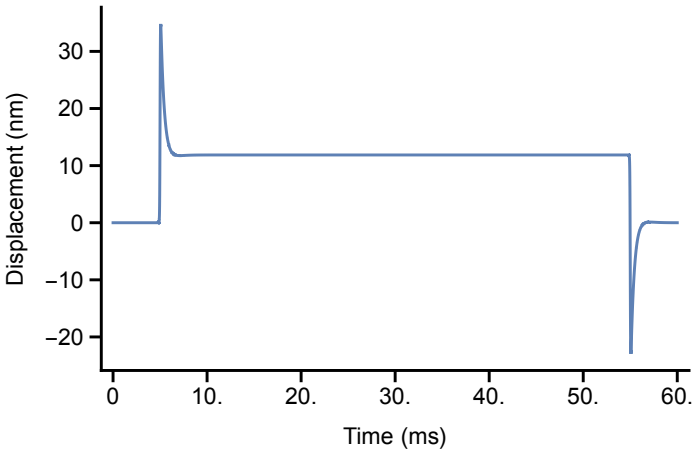
Out[344]= 0.670773

Out[359]= {{Y1 → InterpolatingFunction[Domain: {{0., 60.}} Output: scalar],
Y2 → InterpolatingFunction[Domain: {{0., 60.}} Output: scalar],
Y3 → InterpolatingFunction[Domain: {{0., 60.}} Output: scalar],
Y4 → InterpolatingFunction[Domain: {{0., 60.}} Output: scalar],
Y5 → InterpolatingFunction[Domain: {{0., 60.}} Output: scalar],
Y6 → InterpolatingFunction[Domain: {{0., 60.}} Output: scalar],
Y7 → InterpolatingFunction[Domain: {{0., 60.}} Output: scalar]}}

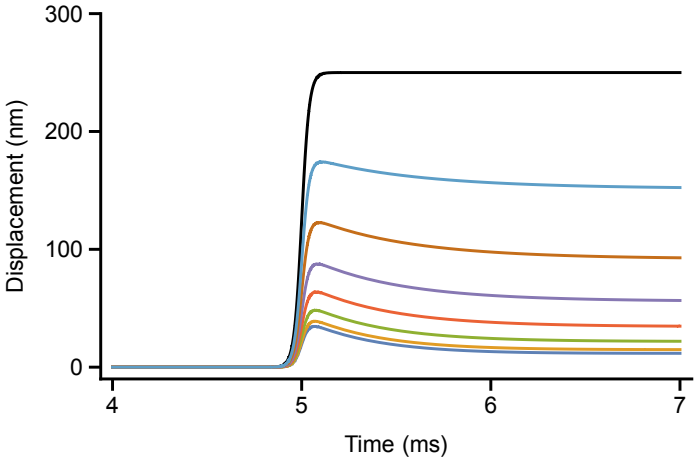
Out[374]=



Out[396]=

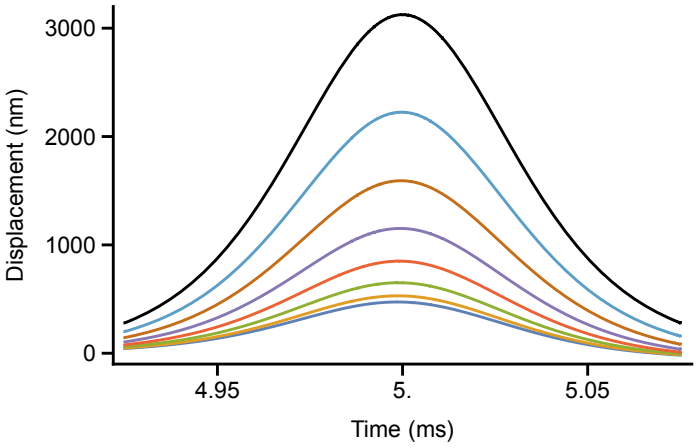


Out[404]=



In[405]:=
```
(*Tick Marks*)
TickLength = 0.02;
Xmin = ts - 0.1;
Xmax = ts + 0.1;
Ymin = 0;
Ymax = 5 * 10^3;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 5 * 10^-2}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 10^3}];
Show[Plot[{Y0f'[t]}, {t, ts - 0.075, ts + 0.075}, PlotRange → {-100, 3.2 * 10^3},
  MaxRecursion → 15, PlotStyle → {Black, Thickness[Linewidth]},
  Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 Plot[{Y7f'[t], Y6f'[t], Y5f'[t], Y4f'[t], Y3f'[t], Y2f'[t], Y1f'[t]},
  {t, ts - 0.075, ts + 0.075}, PlotRange → {-100, 3.2 * 10^3},
  MaxRecursion → 15, PlotStyle → Thickness[Linewidth],
  Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
```

Out[412]=



In[413]:=
```
(**************)
```

In[414]:=
```
(*Plot maximum slope versus stereocilium position*)
Y0slopemax = Evaluate[NMaximize[{Y0f'[t], t < ts + 0.1, t > ts - 0.1}, t][[1]]];
t0slopemax = Evaluate[t /. NMaximize[{Y0f'[t], t < ts + 0.1, t > ts - 0.1}, t][[2]]]
Y1slopemax = Evaluate[NMaximize[{Y1f'[t], t < ts + 0.1, t > ts - 0.1}, t][[1]]];
t1slopemax = Evaluate[t /. NMaximize[{Y1f'[t], t < ts + 0.1, t > ts - 0.1}, t][[2]]]
Y2slopemax = Evaluate[NMaximize[{Y2f'[t], t < ts + 0.1, t > ts - 0.1}, t][[1]]];
t2slopemax = Evaluate[t /. NMaximize[{Y2f'[t], t < ts + 0.1, t > ts - 0.1}, t][[2]]]
Y3slopemax = Evaluate[NMaximize[{Y3f'[t], t < ts + 0.1, t > ts - 0.1}, t][[1]]];
t3slopemax = Evaluate[t /. NMaximize[{Y3f'[t], t < ts + 0.1, t > ts - 0.1}, t][[2]]]
Y4slopemax = Evaluate[NMaximize[{Y4f'[t], t < ts + 0.1, t > ts - 0.1}, t][[1]]];
t4slopemax = Evaluate[t /. NMaximize[{Y4f'[t], t < ts + 0.1, t > ts - 0.1}, t][[2]]]
Y5slopemax = Evaluate[NMaximize[{Y5f'[t], t < ts + 0.1, t > ts - 0.1}, t][[1]]];
t5slopemax = Evaluate[t /. NMaximize[{Y5f'[t], t < ts + 0.1, t > ts - 0.1}, t][[2]]]
Y6slopemax = Evaluate[NMaximize[{Y6f'[t], t < ts + 0.1, t > ts - 0.1}, t][[1]]];
t6slopemax = Evaluate[t /. NMaximize[{Y6f'[t], t < ts + 0.1, t > ts - 0.1}, t][[2]]]
Y7slopemax = Evaluate[NMaximize[{Y7f'[t], t < ts + 0.1, t > ts - 0.1}, t][[1]]];
t7slopemax = Evaluate[t /. NMaximize[{Y7f'[t], t < ts + 0.1, t > ts - 0.1}, t][[2]]]
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = 7;
Ymin = 0;
Ymax = 5 * 10^3;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, Ymax * 1 * 10^-1}];
ListPlot[{{{7, Y7slopemax}}, {{6, Y6slopemax}}, {{5, Y5slopemax}}, {{4, Y4slopemax}},
  {{3, Y3slopemax}}, {{2, Y2slopemax}}, {{1, Y1slopemax}}, {{0, Y0slopemax}}},
 PlotRange → {{Xmin - 0.5, Xmax + 0.5}, {Ymin, All}},
 PlotStyle → Table[{ColorData[97, "ColorList"][[n]], PointSize[0.02]}, {n, 1, 10}],
 PlotStyle → {Black, Thickness[Linewidth]},
 Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
 FrameLabel → {"Stereocilium position", "Slope (nm/ms)"},
 FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}},
   {{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]
```

Out[415]= 5.

Out[417]= 4.99979

Out[419]= 4.99958

Out[421]= 4.99935

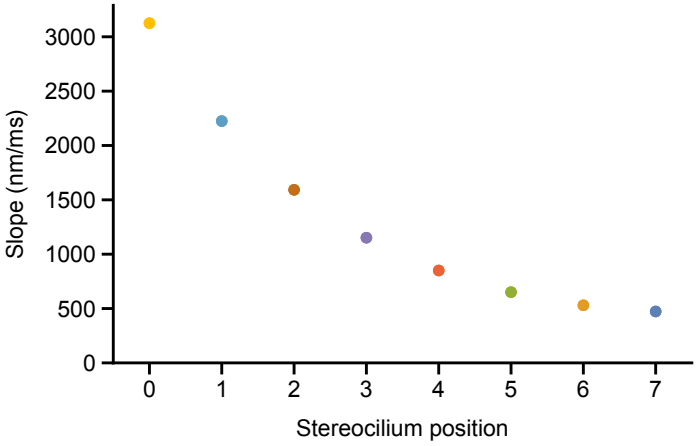
Out[423]= 4.99913

Out[425]= 4.9989

Out[427]= 4.99871

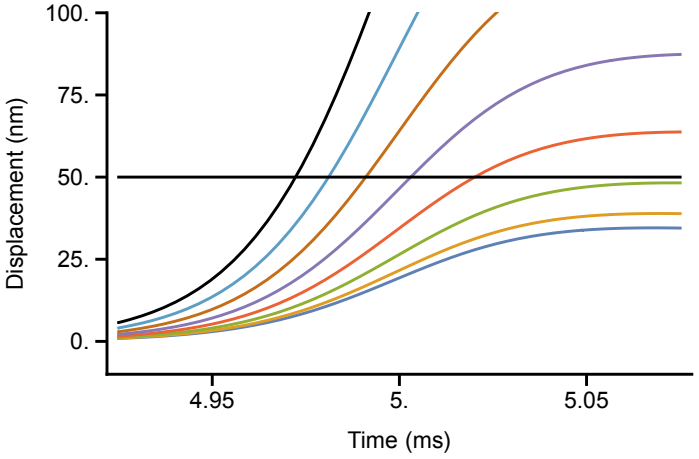
Out[429]= 4.99859

Out[437]=



In[438]:=
```
(*Zoom for time to fixed displacement*)
Yth = 50;
(*Tick Marks*)
TickLength = 0.02;
Xmin = ts - 0.1;
Xmax = ts + 0.1;
Ymin = 0;
Ymax = 100;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 5 * 10^-2}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 2.5 * 10^1}];
Show[Plot[{Y0f[t]}, {t, ts - 0.075, ts + 0.075},
  PlotRange → {Ymin - 10, Ymax}, MaxRecursion → 15,
  PlotStyle → {Black, Thickness[Linewidth]}, Frame → {{True, False}, {True, False}},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 Plot[{Y7f[t], Y6f[t], Y5f[t], Y4f[t], Y3f[t], Y2f[t], Y1f[t]},
  {t, ts - 0.075, ts + 0.075}, PlotRange → All, MaxRecursion → 15,
  PlotStyle → {Thickness[Linewidth]}, Frame → {{True, False}, {True, False}},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 Plot[Yth, {t, ts - 0.075, ts + 0.075}, PlotStyle → {Black, Thickness[Linewidth]}]]
```

Out[446]=



In[447]:=
```
(*Time to absolute displacement lags for noncontacted stereocilia -
 see unnormalized onset zoom. Find time to fixed displacement.*)
(*NaN if Yth is not achieved*)
deltat = 10^-5;
tmin = ts - 0.1;
tmax = ts + 0.1;
ttable = Table[t, {t, tmin, tmax, deltat}];
t0max = If[Total[Table[If[Y0f[t] - Yth > 0, 1, 0], {t, tmin, tmax, deltat}]] > 0,
  ttable[[Flatten[Position[Table[Abs[Y0f[t] - Yth], {t, tmin, tmax, deltat}],
      Min[Table[Abs[Y0f[t] - Yth], {t, tmin, tmax, deltat}]]]][[1]], NaN];
t1max = If[Total[Table[If[Y1f[t] - Yth > 0, 1, 0], {t, tmin, tmax, deltat}]] > 0,
  ttable[[Flatten[Position[Table[Abs[Y1f[t] - Yth], {t, tmin, tmax, deltat}],
      Min[Table[Abs[Y1f[t] - Yth], {t, tmin, tmax, deltat}]]]][[1]], NaN];
t2max = If[Total[Table[If[Y2f[t] - Yth > 0, 1, 0], {t, tmin, tmax, deltat}]] > 0,
   ttable[[Flatten[Position[Table[Abs[Y2f[t] - Yth], {t, tmin, tmax, deltat}],
       Min[Table[Abs[Y2f[t] - Yth], {t, tmin, tmax, deltat}]]]][[1]], NaN];
t3max = If[Total[Table[If[Y3f[t] - Yth > 0, 1, 0], {t, tmin, tmax, deltat}]] > 0,
   ttable[[Flatten[Position[Table[Abs[Y3f[t] - Yth], {t, tmin, tmax, deltat}],
       Min[Table[Abs[Y3f[t] - Yth], {t, tmin, tmax, deltat}]]]][[1]], NaN];
t4max = If[Total[Table[If[Y4f[t] - Yth > 0, 1, 0], {t, tmin, tmax, deltat}]] > 0,
   ttable[[Flatten[Position[Table[Abs[Y4f[t] - Yth], {t, tmin, tmax, deltat}],
       Min[Table[Abs[Y4f[t] - Yth], {t, tmin, tmax, deltat}]]]][[1]], NaN];
t5max = If[Total[Table[If[Y5f[t] - Yth > 0, 1, 0], {t, tmin, tmax, deltat}]] > 0,
   ttable[[Flatten[Position[Table[Abs[Y5f[t] - Yth], {t, tmin, tmax, deltat}],
       Min[Table[Abs[Y5f[t] - Yth], {t, tmin, tmax, deltat}]]]][[1]], NaN];
t6max = If[Total[Table[If[Y6f[t] - Yth > 0, 1, 0], {t, tmin, tmax, deltat}]] > 0,
   ttable[[Flatten[Position[Table[Abs[Y6f[t] - Yth], {t, tmin, tmax, deltat}],
       Min[Table[Abs[Y6f[t] - Yth], {t, tmin, tmax, deltat}]]]][[1]], NaN];
t7max = If[Total[Table[If[Y7f[t] - Yth > 0, 1, 0], {t, tmin, tmax, deltat}]] > 0,
   ttable[[Flatten[Position[Table[Abs[Y7f[t] - Yth], {t, tmin, tmax, deltat}],
       Min[Table[Abs[Y7f[t] - Yth], {t, tmin, tmax, deltat}]]]][[1]], NaN];
{t0max, t1max, t2max, t3max, t4max, t5max, t6max, t7max}
```

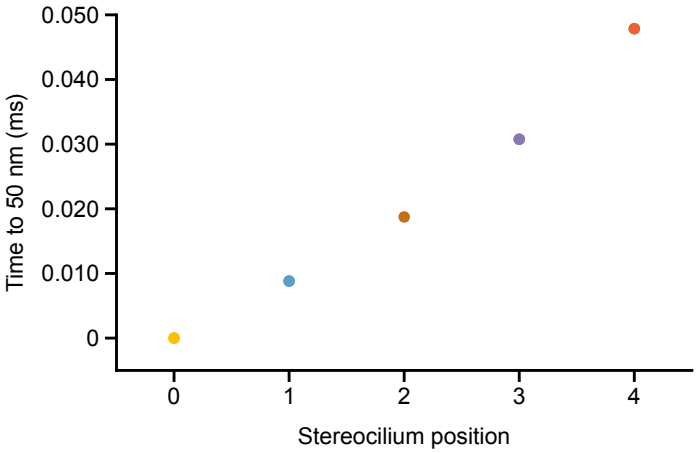
Out[458]=
```
{4.97227, 4.98109, 4.99101, 5.00303, 5.02013, NaN, NaN, NaN}
```

In[459]:=
```
(*Delay relative to stimulated
 stereocilium increases with stereocilium position*)
{{{1, t1max - t0max}}, {{2, t2max - t0max}}, {{3, t3max - t0max}},
 {{4, t4max - t0max}}, {{5, t5max - t0max}}, {{6, t6max - t0max}}, {{7, t7max - t0max}}}
```

Out[459]=
```
{{{1, 0.00882}}, {{2, 0.01874}}, {{3, 0.03076}},
 {{4, 0.04786}}, {{5, NaN}}, {{6, NaN}}, {{7, NaN}}}
```

In[460]:=
```
(*Responses lag stimulus*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = 4;
Ymin = 0;
Ymax = 0.05;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Ymin, Ymax, 1 * 10^-2}];
ListPlot[{{{0, t0max - t0max}}, {{1, t1max - t0max}},
  {2, t2max - t0max}, {{3, t3max - t0max}}, {{4, t4max - t0max}}},
 PlotRange → {{Xmin - 0.5, Xmax + 0.5}, {Ymin - 0.005, Ymax}},
 PlotStyle → Table[{ColorData[97, "ColorList"][[n]], PointSize[0.02]}, {n, 8, 1, -1}],
 Frame → {{True, False}, {True, False}},
 FrameLabel → {"Stereocilium position", "Time to 50 nm (ms)"},
 FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
 FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}},
   {{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]
```

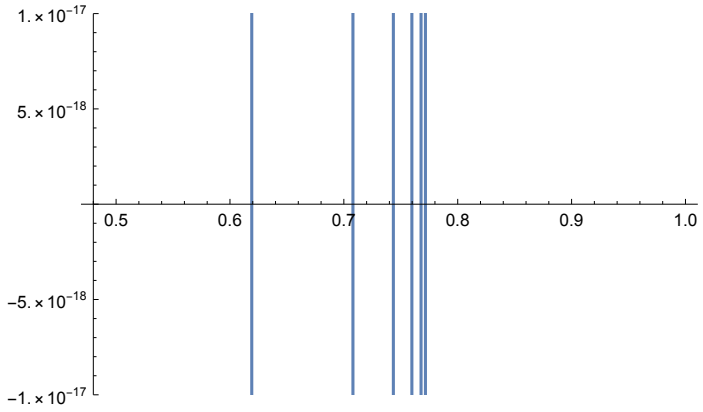
Out[467]=



In[468]:=
```
(*There are ntotv-1 time constants. Roots are time constants.*)
```

In[469]:=
```
Plot[g[ntotv - 1, -tau * KAv + gammaAv, -tau * KLv + gammaLv],
 {tau, 0.48, 1}, PlotRange → {-10^-17, 10^-17}]
```

Out[469]=



In[470]:=
```
(*Find effective time constants from fitting. 1 time
 constant is sufficient. 2 time constants doesn't work.*)
```

In[471]:=
```
taufit = Table[NaN, {n, 1, ntotv - 1}];
```

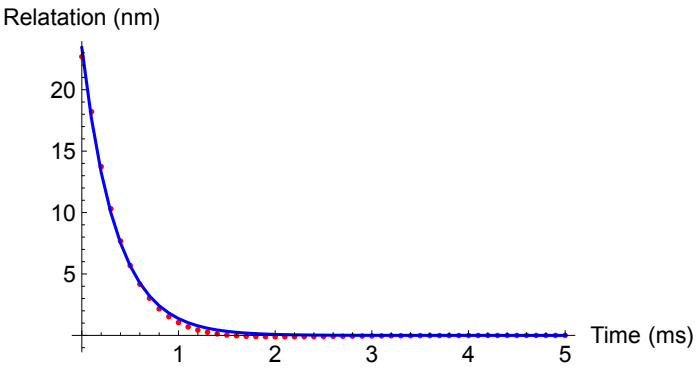
In[472]:=
```
(*Time after peak to fit*)
tfitend = 5;
```

In[473]:=
```
Yfittable = Table[{t, Y7f[t + t7peak] - Y[7, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
taufit[[7]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

Out[478]=

	Estimate	Standard Error	t-Statistic	P-Value	
tau	0.352212	0.00448972	78.4486	3.52386	$\times 10^{-53}$
A	23.4182	0.18434	127.038	2.18774	$\times 10^{-63}$

AdjustedRSquared	0.997987
AIC	−3.98866
BIC	1.80681
RSquared	0.998066



	Estimate	Standard Error	t-Statistic	P-Value
A1	12.6489	69.9233	0.180896	0.857227
tau1	0.352212	3.06055 $\times 10^{8}$	1.15081 $\times 10^{-9}$	1
A2	10.7693	70.0085	0.153829	0.878403
tau2	0.352212	3.5947 $\times 10^{8}$	9.79811 $\times 10^{-10}$	1

AdjustedRSquared	0.997901
AIC	0.136645
BIC	9.79577
RSquared	0.998066

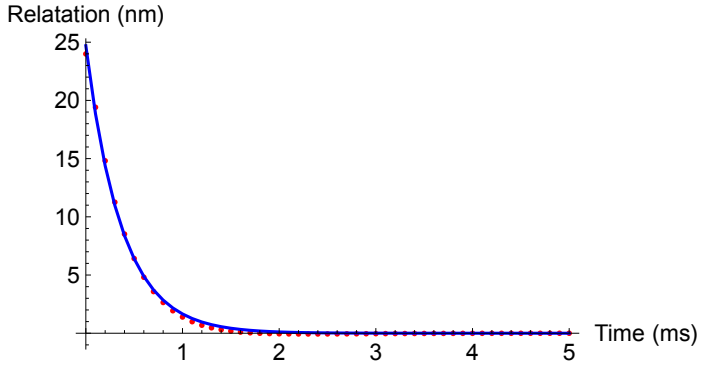
In[482]:=

```
Yfittable = Table[{t, Y6f[t + t6peak] - Y[6, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
taufit[[6]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

	Estimate	Standard Error	t-Statistic	P-Value
tau	0.370121	0.00387719	95.4611	2.4946 $\times 10^{-57}$
A	24.6955	0.160756	153.621	2.02638 $\times 10^{-67}$

AdjustedRSquared	0.998636
AIC	−16.5697
BIC	−10.7742
RSquared	0.99869

Out[487]=



	Estimate	Standard Error	t-Statistic	P-Value
A1	4.85625	0.0908163	53.4734	9.38463×10^{-44}
tau1	0.370121	1.45459×10^{6}	2.5445×10^{-7}	1.
A2	19.8393	0.0900762	220.25	1.70284×10^{-72}
tau2	0.370121	356 055.	1.03951×10^{-6}	0.999999

```
AdjustedRSquared 0.998578
AIC              -12.4444
BIC              -2.78528
RSquared         0.99869
```

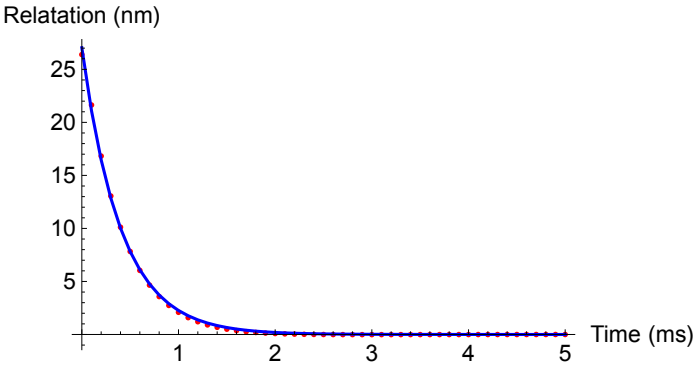
In[491]:=

```
Yfittable = Table[{t, Y5f[t + t5peak] - Y[5, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
taufit[[5]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

	Estimate	Standard Error	t-Statistic	P-Value
tau	0.403118	0.00299673	134.519	1.33596×10^{-64}
A	27.038	0.126176	214.288	1.71568×10^{-74}

```
AdjustedRSquared 0.99931
AIC              -38.7926
BIC              -32.9971
RSquared         0.999337
```

Out[496]=



	Estimate	Standard Error	t-Statistic	P-Value
A1	18.4304	0.0714963	257.781	1.05203×10^{-75}
tau1	0.403118	516168.	7.80983×10^{-7}	0.999999
A2	8.60764	0.0714114	120.536	3.25927×10^{-60}
tau2	0.403118	1.1052×10^{6}	3.64747×10^{-7}	1.

AdjustedRSquared	0.999281
AIC	−34.6673
BIC	−25.0081
RSquared	0.999337

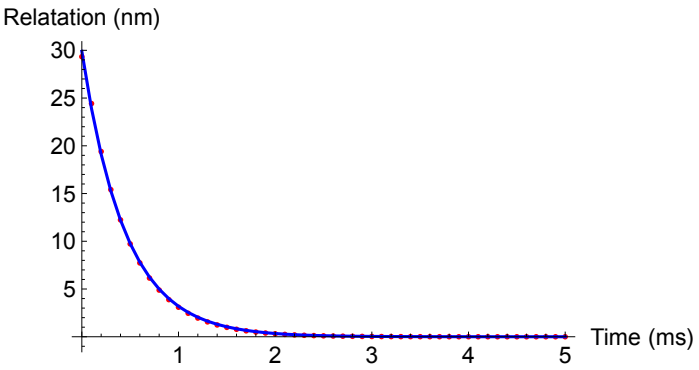
In[500]:=

```
Yfittable = Table[{t, Y4f[t + t4peak] - Y[4, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
taufit[[4]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

Out[505]=

	Estimate	Standard Error	t-Statistic	P-Value
tau	0.446751	0.00228354	195.639	1.47814×10^{-72}
A	29.8966	0.0970107	308.179	3.21891×10^{-82}

AdjustedRSquared 0.999672
AIC −62.4509
BIC −56.6555
RSquared 0.999685



	Estimate	Standard Error	t-Statistic	P-Value
A1	11.3514	0.0553191	205.199	4.72603×10^{-71}
tau1	0.446751	438406.	1.01903	$\times 10^{-6}$ 0.999999
A2	18.5452	0.0553904	334.809	4.87766×10^{-81}
tau2	0.446751	268346.	1.66483	$\times 10^{-6}$ 0.999999

AdjustedRSquared 0.999659
AIC −58.3256
BIC −48.6665
RSquared 0.999685

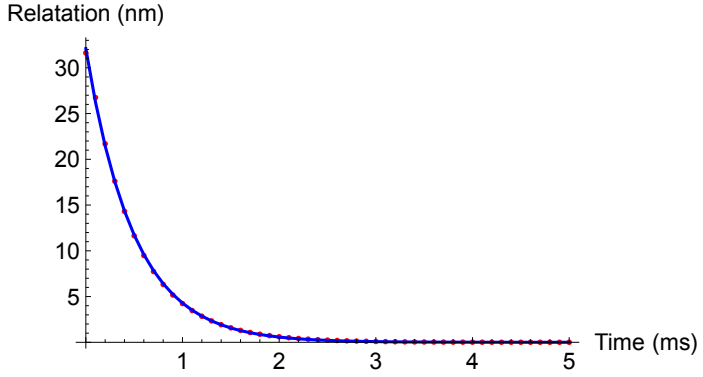
In[509]:=

```
Yfittable = Table[{t, Y3f[t + t3peak] - Y[3, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
taufit[[3]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

	Estimate	Standard Error	t-Statistic	P-Value
tau	0.496798	0.00197551	251.478	6.78973×10^{-78}
A	32.0922	0.0818683	391.998	2.45592×10^{-87}

```
AdjustedRSquared 0.999801
AIC              -76.324
BIC              -70.5285
RSquared         0.999809
```

Out[514]=



	Estimate	Standard Error	t-Statistic	P-Value
A1	20.0693	0.0466271	430.42	3.65081×10^{-86}
tau1	0.496798	453685.	1.09503	$\times 10^{-6}$ 0.999999
A2	12.0229	0.0475144	253.038	2.51679×10^{-75}
tau2	0.496798	757313.	6.56001	$\times 10^{-7}$ 0.999999

```
AdjustedRSquared 0.999793
AIC              -72.1987
BIC              -62.5396
RSquared         0.999809
```

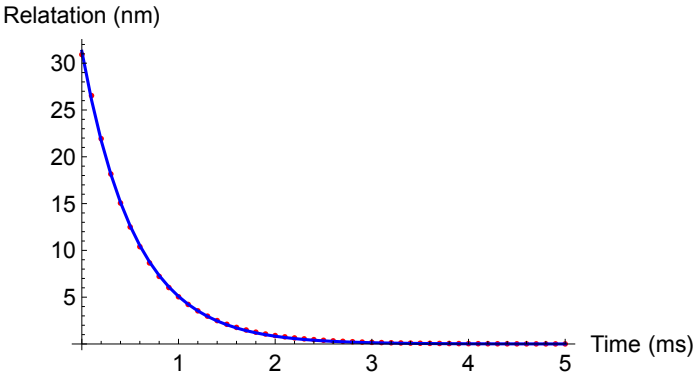
In[518]:=

```
Yfittable = Table[{t, Y2f[t + t2peak] - Y[2, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
taufit[[2]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

	Estimate	Standard Error	t-Statistic	P-Value
tau	0.550522	0.00196992	279.464	3.87159×10^{-80}
A	31.2761	0.0724609	431.627	2.19466×10^{-89}

```
AdjustedRSquared 0.999839
AIC              -85.2881
BIC              -79.4926
RSquared         0.999845
```

Out[523]=



	Estimate	Standard Error	t-Statistic	P-Value	
A1	31.1103	0.414422	75.0691	1.34328	$\times 10^{-50}$
tau1	0.544227	0.00718787	75.7146	9.01176	$\times 10^{-51}$
A2	0.213512	0.43598	0.489729	0.626604	
tau2	1.98604	2.5007	0.794194	0.431074	

```
AdjustedRSquared 0.999847
AIC              -86.1794
BIC              -76.5202
RSquared         0.999859
```

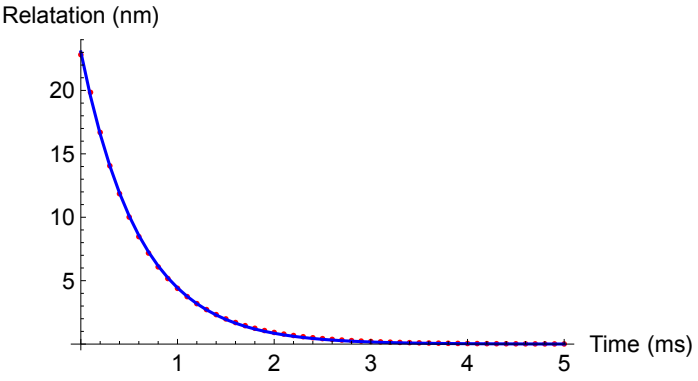
In[527]:=

```
Yfittable = Table[{t, Y1f[t + t1peak] - Y[1, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
taufit[[1]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

Out[532]=

	Estimate	Standard Error	t-Statistic	P-Value	
tau	0.60678	0.00203442	298.257	1.59874	$\times 10^{-81}$
A	23.0333	0.0504004	457.006	1.33596	$\times 10^{-90}$

AdjustedRSquared	0.999858
AIC	−118.878
BIC	−113.082
RSquared	0.999864

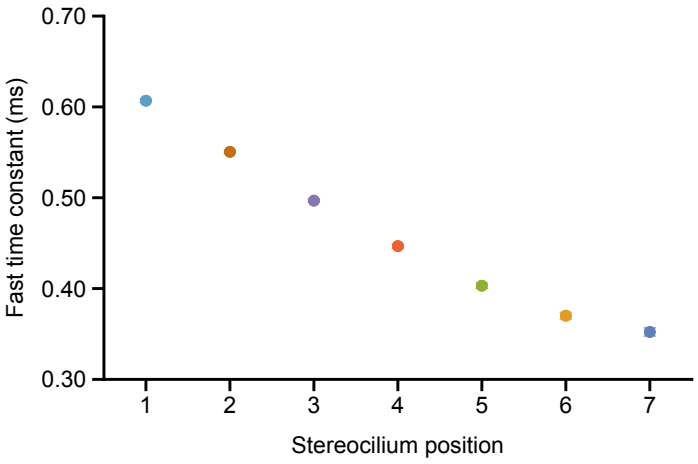


	Estimate	Standard Error	t-Statistic	P-Value	
A1	0.424729	0.683532	0.621374	0.537356	
tau1	1.53201	1.08244	1.41533	0.163564	
A2	22.6673	0.665236	34.074	8.65444	$\times 10^{-35}$
tau2	0.593344	0.0111772	53.085	1.3147	$\times 10^{-43}$

AdjustedRSquared	0.999882
AIC	−126.225
BIC	−116.566
RSquared	0.999891

In[536]:=
```
(*Stereocilium farthest from probe relaxes with the smallest time constant!*)
(*Chose gammaL/KL to match experimental time constants*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 1;
Xmax = 7;
Ymin = 0;
Ymax = 1;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Ymin, Ymax, 1 * 10^-1}];
ListPlot[Reverse[Table[{{n, taufit[[n]]}}, {n, 1, ntotv - 1}]],
 PlotRange → {{Xmin - 0.5, Xmax + 0.5}, {0.3, 0.7}}, PlotStyle →
  Table[{ColorData[97, "ColorList"][[m]], PointSize[0.02]}, {m, 1, ntotv - 1}],
 IntervalMarkersStyle → Table[{ColorData[97, "ColorList"][[m]], PointSize[0.02]},
   {m, 1, ntotv - 1}], Frame → {{True, False}, {True, False}},
 FrameLabel → {"Stereocilium position", "Fast time constant (ms)"},
 FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
 FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}},
   {{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]
```

Out[543]=



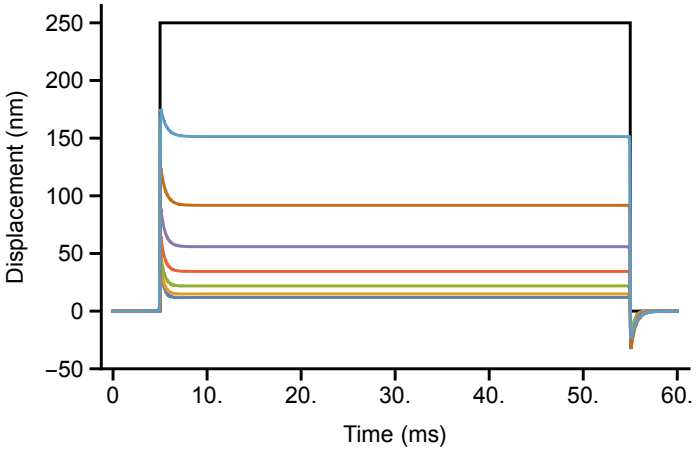
In[544]:=
```
(**********************************)
(**********************************)
```

In[545]:=
```
(*Speed up stimulus to approximate ideal step*)
ntotv = ssnstereoList[[wingindexnum2]]
Y0v = 250 (*nm*);
slopefac = 10^9;
ts = 5;
te = 55;
trange = 60;
Y0slowf[t_] :=
  Y0v * Evaluate[(1 + Exp[-(t - ts) * slopefac])^-1 - (1 + Exp[-(t - te) * slopefac])^-1];
```

Out[545]= 8

In[552]:=
```
(*Stimulus and responses*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = trange;
Ymin = -50;
Ymax = 250;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 1 * 10^1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 5 * 10^1}];
FastPlot =
 Show[Plot[{Y0f[t]}, {t, 0, trange}, PlotRange → {-50, Ymax + 15}, MaxRecursion → 15,
   PlotStyle → {Black, Thickness[Linewidth]}, Frame → {{True, False}, {True, False}},
   FrameTicks → {XTicks, YTicks}, FrameLabel → {"Time (ms)", "Displacement (nm)"},
   FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
       {Black, Thickness[Linewidth], FontSize → Fontsize}},
      {{Black, Thickness[Linewidth], FontSize → Fontsize},
       {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
  Plot[{Y7f[t], Y6f[t], Y5f[t], Y4f[t], Y3f[t], Y2f[t], Y1f[t]},
   {t, 0, trange}, MaxRecursion → 15, PlotStyle → Thickness[Linewidth],
   Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
   FrameLabel → {"Time (ms)", "Displacement (nm)"},
   FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
       {Black, Thickness[Linewidth], FontSize → Fontsize}},
      {{Black, Thickness[Linewidth], FontSize → Fontsize},
       {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
```

Out[559]=



In[560]:=
```
(***********************************)
(***********************************)
```

In[561]:=
```
(*Slow stimulus to remove reverse*)
ntotv = ssnstereoList[[wingindexnum2]]
Y0v = 250 (*nm*);
slopefac = 1;
ts = 5;
te = 55;
trange = 60;
Y0slowf[t_] :=
  Y0v * Evaluate[(1 + Exp[-(t - ts) * slopefac]) ^ -1 - (1 + Exp[-(t - te) * slopefac]) ^ -1];
```

Out[561]= 8

In[568]:=
```
(*Doesn't work unless we use the equation simplification method*)
(*8 cilia, Y0 clamped, all cilia have rootlets. For 10 kHz low-
  pass filtered experimental stimulus use s =
 10*4 = 40 such that the maximum slope is 5 kHz.*)
KLv = 5;(*mN/m*)
KAv = ssAoLList[[wingindexnum2, 1, 2]] * KLv;
gammaLv = 0.8 * KLv;(*uN.s/m*)
gammaLv / KLv(*ms*)
gammaAv = onsetAoLList[[wingindexnum2, 1, 2]] * gammaLv;
KAoLv = KAv / KLv;
gammaAoLv = gammaAv / gammaLv;
(*Geometric mean time constant*)
taugmv = (gammaLv / KLv) *
  (g[ntotv - 1, gammaAoLv, 1] / g[ntotv - 1, KAv / KLv, 1]) ^ (1 / (ntotv - 1))
KA1v = KAv; gammaA1v = gammaAv;
KA2v = KAv; gammaA2v = gammaAv;
KA3v = KAv; gammaA3v = gammaAv;
KA4v = KAv; gammaA4v = gammaAv;
KA5v = KAv; gammaA5v = gammaAv;
KA6v = KAv; gammaA6v = gammaAv;
KA7v = KAv; gammaA7v = gammaAv;
K1v = KLv; gamma1v = gammaLv;
K2v = KLv; gamma2v = gammaLv;
K3v = KLv; gamma3v = gammaLv;
K4v = KLv; gamma4v = gammaLv;
K5v = KLv; gamma5v = gammaLv;
K6v = KLv; gamma6v = gammaLv;
K7v = KLv; gamma7v = gammaLv;
Ysln =
 NDSolve[{KA1v * Y1[t] + gammaA1v * Y1'[t] + K1v * (Y1[t] - Y0f[t]) - K2v * (Y2[t] - Y1[t]) +
     gamma1v * (Y1'[t] - Y0f'[t]) - gamma2v * (Y2'[t] - Y1'[t]) == 0, Y1[0] == 0,
   KA2v * Y2[t] + gammaA2v * Y2'[t] + K2v * (Y2[t] - Y1[t]) - K3v * (Y3[t] - Y2[t]) +
```

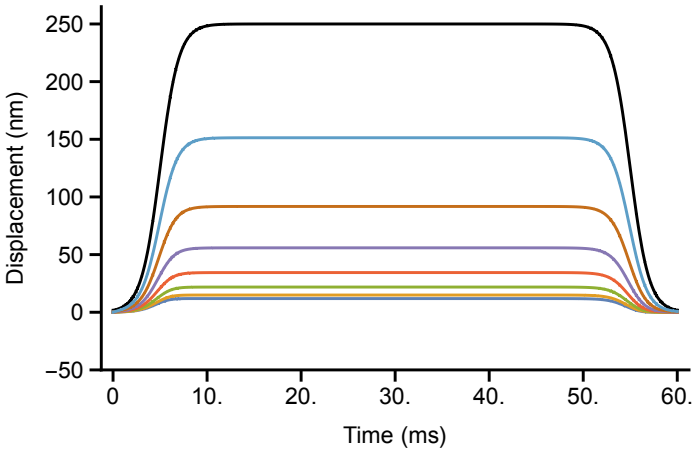
```
      gamma2v * (Y2'[t] - Y1'[t]) - gamma3v * (Y3'[t] - Y2'[t]) == 0, Y2[0] == 0,
    KA3v * Y3[t] + gammaA3v * Y3'[t] + K3v * (Y3[t] - Y2[t]) - K4v * (Y4[t] - Y3[t]) +
      gamma3v * (Y3'[t] - Y2'[t]) - gamma4v * (Y4'[t] - Y3'[t]) == 0, Y3[0] == 0,
    KA4v * Y4[t] + gammaA4v * Y4'[t] + K4v * (Y4[t] - Y3[t]) - K5v * (Y5[t] - Y4[t]) +
      gamma4v * (Y4'[t] - Y3'[t]) - gamma5v * (Y5'[t] - Y4'[t]) == 0, Y4[0] == 0,
    KA5v * Y5[t] + gammaA5v * Y5'[t] + K5v * (Y5[t] - Y4[t]) - K6v * (Y6[t] - Y5[t]) +
      gamma5v * (Y5'[t] - Y4'[t]) - gamma6v * (Y6'[t] - Y5'[t]) == 0, Y5[0] == 0,
    KA6v * Y6[t] + gammaA6v * Y6'[t] + K6v * (Y6[t] - Y5[t]) - K7v * (Y7[t] - Y6[t]) +
      gamma6v * (Y6'[t] - Y5'[t]) - gamma7v * (Y7'[t] - Y6'[t]) == 0, Y6[0] == 0,
    KA7v * Y7[t] + gammaA7v * Y7'[t] + K7v * (Y7[t] - Y6[t]) + gamma7v * (Y7'[t] - Y6'[t]) ==
     0, Y7[0] == 0}, {Y1, Y2, Y3, Y4, Y5, Y6, Y7},
  {t, 0, trange}, Method → {"EquationSimplification" → "Residual"}]
Y1slowf[t_] := Evaluate[Y1[t] /. Ysln[[1]]]
Y2slowf[t_] := Evaluate[Y2[t] /. Ysln[[1]]]
Y3slowf[t_] := Evaluate[Y3[t] /. Ysln[[1]]]
Y4slowf[t_] := Evaluate[Y4[t] /. Ysln[[1]]]
Y5slowf[t_] := Evaluate[Y5[t] /. Ysln[[1]]]
Y6slowf[t_] := Evaluate[Y6[t] /. Ysln[[1]]]
Y7slowf[t_] := Evaluate[Y7[t] /. Ysln[[1]]]
(*Stimulus and responses*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = trange;
Ymin = -50;
Ymax = 250;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 1 * 10^1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 5 * 10^1}];
SlowPlot = Show[
  Plot[{Y0slowf[t]}, {t, 0, trange}, PlotRange → {-50, Ymax + 15}, MaxRecursion → 15,
   PlotStyle → {Black, Thickness[Linewidth]}, Frame → {{True, False}, {True, False}},
   FrameTicks → {XTicks, YTicks}, FrameLabel → {"Time (ms)", "Displacement (nm)"},
   FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}},
     {{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
  Plot[{Y7slowf[t], Y6slowf[t], Y5slowf[t], Y4slowf[t],
    Y3slowf[t], Y2slowf[t], Y1slowf[t]}, {t, 0, trange}, MaxRecursion → 15,
   PlotStyle → Thickness[Linewidth], Frame → {{True, False}, {True, False}},
   FrameTicks → {XTicks, YTicks}, FrameLabel → {"Time (ms)", "Displacement (nm)"},
   FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}},
     {{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
```

Out[571]= 0.8

Out[575]= 0.670773

Out[590]= {{Y1 → InterpolatingFunction[Domain: {{0., 60. }} Output: scalar],
Y2 → InterpolatingFunction[Domain: {{0., 60. }} Output: scalar],
Y3 → InterpolatingFunction[Domain: {{0., 60. }} Output: scalar],
Y4 → InterpolatingFunction[Domain: {{0., 60. }} Output: scalar],
Y5 → InterpolatingFunction[Domain: {{0., 60. }} Output: scalar],
Y6 → InterpolatingFunction[Domain: {{0., 60. }} Output: scalar],
Y7 → InterpolatingFunction[Domain: {{0., 60. }} Output: scalar]}}

Out[605]=



In[606]:=
```
(************************************)
(************************************)
```

In[607]:=
```
(*Slow offset speed in comparison to onset speed*)
```

In[608]:=
```
(*Match slope of stimulus to experimental data*)
ntotv = ssnstereoList[[wingindexnum2]]
Y0v = 250 (*nm*);
slopefaconset = 50;
slopefacoffset = 10;
ts = 5;
te = 55;
trange = 60;
Y0f[t_] := Y0v * Evaluate[
     (1 + Exp[- (t - ts) * slopefaconset]) ^ - 1 - (1 + Exp[- (t - te) * slopefacoffset]) ^ - 1];
```

Out[608]= 8

In[616]:=
```
(*Doesn't work unless we use the equation simplification method*)
(*8 cilia, Y0 clamped, all cilia have rootlets. For 10 kHz low-
  pass filtered experimental stimulus use s =
 10*4 = 40 such that the maximum slope is 5 kHz.*)
KLv = 5;(*mN/m*)
KAv = ssAoLList[[wingindexnum2, 1, 2]] * KLv;
gammaLv = 0.8 * KLv;(*uN.s/m*)
gammaLv / KLv(*ms*)
gammaAv = onsetAoLList[[wingindexnum2, 1, 2]] * gammaLv;
KAoLv = KAv / KLv;
gammaAoLv = gammaAv / gammaLv;
(*Geometric mean time constant*)
taugmv = (gammaLv / KLv) *
   (g[ntotv - 1, gammaAoLv, 1] / g[ntotv - 1, KAv / KLv, 1]) ^ (1 / (ntotv - 1))
KA1v = KAv; gammaA1v = gammaAv;
KA2v = KAv; gammaA2v = gammaAv;
KA3v = KAv; gammaA3v = gammaAv;
KA4v = KAv; gammaA4v = gammaAv;
KA5v = KAv; gammaA5v = gammaAv;
KA6v = KAv; gammaA6v = gammaAv;
KA7v = KAv; gammaA7v = gammaAv;
K1v = KLv; gamma1v = gammaLv;
K2v = KLv; gamma2v = gammaLv;
K3v = KLv; gamma3v = gammaLv;
K4v = KLv; gamma4v = gammaLv;
K5v = KLv; gamma5v = gammaLv;
K6v = KLv; gamma6v = gammaLv;
K7v = KLv; gamma7v = gammaLv;
Ysln =
 NDSolve[{KA1v * Y1[t] + gammaA1v * Y1'[t] + K1v * (Y1[t] - Y0f[t]) - K2v * (Y2[t] - Y1[t]) +
     gamma1v * (Y1'[t] - Y0f'[t]) - gamma2v * (Y2'[t] - Y1'[t]) == 0, Y1[0] == 0,
```

```
    KA2v * Y2[t] + gammaA2v * Y2'[t] + K2v * (Y2[t] - Y1[t]) - K3v * (Y3[t] - Y2[t]) +
      gamma2v * (Y2'[t] - Y1'[t]) - gamma3v * (Y3'[t] - Y2'[t]) == 0, Y2[0] == 0,
    KA3v * Y3[t] + gammaA3v * Y3'[t] + K3v * (Y3[t] - Y2[t]) - K4v * (Y4[t] - Y3[t]) +
      gamma3v * (Y3'[t] - Y2'[t]) - gamma4v * (Y4'[t] - Y3'[t]) == 0, Y3[0] == 0,
    KA4v * Y4[t] + gammaA4v * Y4'[t] + K4v * (Y4[t] - Y3[t]) - K5v * (Y5[t] - Y4[t]) +
      gamma4v * (Y4'[t] - Y3'[t]) - gamma5v * (Y5'[t] - Y4'[t]) == 0, Y4[0] == 0,
    KA5v * Y5[t] + gammaA5v * Y5'[t] + K5v * (Y5[t] - Y4[t]) - K6v * (Y6[t] - Y5[t]) +
      gamma5v * (Y5'[t] - Y4'[t]) - gamma6v * (Y6'[t] - Y5'[t]) == 0, Y5[0] == 0,
    KA6v * Y6[t] + gammaA6v * Y6'[t] + K6v * (Y6[t] - Y5[t]) - K7v * (Y7[t] - Y6[t]) +
      gamma6v * (Y6'[t] - Y5'[t]) - gamma7v * (Y7'[t] - Y6'[t]) == 0, Y6[0] == 0,
    KA7v * Y7[t] + gammaA7v * Y7'[t] + K7v * (Y7[t] - Y6[t]) + gamma7v * (Y7'[t] - Y6'[t]) ==
     0, Y7[0] == 0}, {Y1, Y2, Y3, Y4, Y5, Y6, Y7},
   {t, 0, trange}, Method → {"EquationSimplification" → "Residual"}]
Y1f[t_] := Evaluate[Y1[t] /. Ysln[[1]]]
Y2f[t_] := Evaluate[Y2[t] /. Ysln[[1]]]
Y3f[t_] := Evaluate[Y3[t] /. Ysln[[1]]]
Y4f[t_] := Evaluate[Y4[t] /. Ysln[[1]]]
Y5f[t_] := Evaluate[Y5[t] /. Ysln[[1]]]
Y6f[t_] := Evaluate[Y6[t] /. Ysln[[1]]]
Y7f[t_] := Evaluate[Y7[t] /. Ysln[[1]]]
(*Stimulus and responses*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = trange;
Ymin = 0;
Ymax = 250;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 1 * 10^1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 5 * 10^1}];
Show[Plot[{Y0f[t]}, {t, 0, trange}, PlotRange → {Ymin - 15, Ymax + 15},
  MaxRecursion → 15, PlotStyle → {Black, Thickness[Linewidth]},
  Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 Plot[{Y7f[t], Y6f[t], Y5f[t], Y4f[t], Y3f[t], Y2f[t], Y1f[t]},
  {t, 0, trange}, MaxRecursion → 15, PlotStyle → Thickness[Linewidth],
  Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
```

```
      {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
(*Decay rates are different.*)
Y1peak = Evaluate[NMaximize[{Y1f[t], t < trange / 2, t > 0}, t][[1]]];
t1peak = Evaluate[t /. NMaximize[{Y1f[t], t < trange / 2, t > 0}, t][[2]]];
Y2peak = Evaluate[NMaximize[{Y2f[t], t < trange / 2, t > 0}, t][[1]]];
t2peak = Evaluate[t /. NMaximize[{Y2f[t], t < trange / 2, t > 0}, t][[2]]];
Y3peak = Evaluate[NMaximize[{Y3f[t], t < trange / 2, t > 0}, t][[1]]];
t3peak = Evaluate[t /. NMaximize[{Y3f[t], t < trange / 2, t > 0}, t][[2]]];
Y4peak = Evaluate[NMaximize[{Y4f[t], t < trange / 2, t > 0}, t][[1]]];
t4peak = Evaluate[t /. NMaximize[{Y4f[t], t < trange / 2, t > 0}, t][[2]]];
Y5peak = Evaluate[NMaximize[{Y5f[t], t < trange / 2, t > 0}, t][[1]]];
t5peak = Evaluate[t /. NMaximize[{Y5f[t], t < trange / 2, t > 0}, t][[2]]];
Y6peak = Evaluate[NMaximize[{Y6f[t], t < trange / 2, t > 0}, t][[1]]];
t6peak = Evaluate[t /. NMaximize[{Y6f[t], t < trange / 2, t > 0}, t][[2]]];
Y7peak = Evaluate[NMaximize[{Y7f[t], t < trange / 2, t > 0}, t][[1]]];
t7peak = Evaluate[t /. NMaximize[{Y7f[t], t < trange / 2, t > 0}, t][[2]]];
(*Stereocilium 7 response*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = trange;
Ymin = -50;
Ymax = 50;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 1 * 10^1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 1 * 10^1}];
stereocilium1asymmplot =
 Show[Plot[{Y7f[t]}, {t, 0, trange}, PlotRange → All, MaxRecursion → 15,
   PlotStyle → {Thickness[Linewidth], Red}, Frame → {{True, False}, {True, False}},
   FrameTicks → {XTicks, YTicks}, FrameLabel → {"Time (ms)", "Displacement (nm)"},
   FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}},
     {{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
Show[stereocilium1symmplot, stereocilium1asymmplot]
```

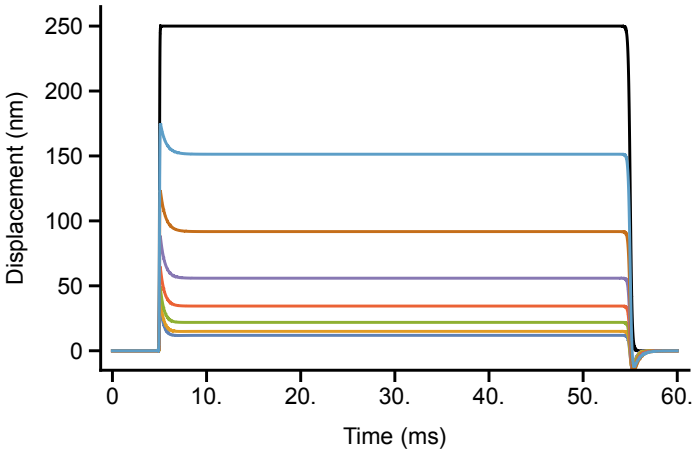
Out[619]= 0.8

Out[623]= 0.670773

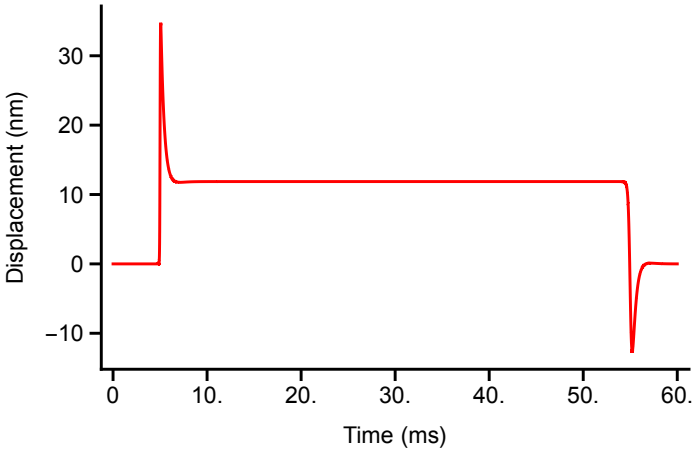
Out[638]=

```
{{Y1 → InterpolatingFunction[ Domain: {{0., 60. }}
                              Output: scalar ],
  Y2 → InterpolatingFunction[ Domain: {{0., 60. }}
                              Output: scalar ],
  Y3 → InterpolatingFunction[ Domain: {{0., 60. }}
                              Output: scalar ],
  Y4 → InterpolatingFunction[ Domain: {{0., 60. }}
                              Output: scalar ],
  Y5 → InterpolatingFunction[ Domain: {{0., 60. }}
                              Output: scalar ],
  Y6 → InterpolatingFunction[ Domain: {{0., 60. }}
                              Output: scalar ],
  Y7 → InterpolatingFunction[ Domain: {{0., 60. }}
                              Output: scalar ]}}
```

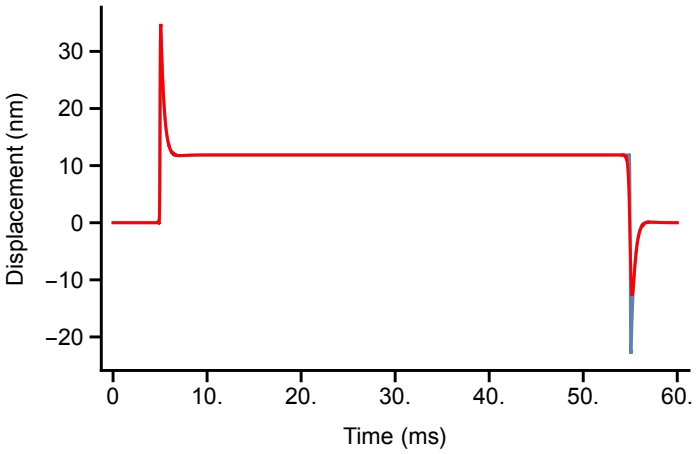
Out[653]=



Out[675]=



Out[676]=



In[677]:=
```
(*****************************)
(***********Predictions*****************)
(*****************************)
```

In[678]:=
```
Data[[wingindex[[wingindexnum2]], 1]]
```

Out[678]= S8811019_1_left

In[679]:=
```
Min[onsetAoLListrenum[[All, 1, 2]]]
Min[ssAoLListrenum[[All, 1, 2]]]
```

Out[679]= 0.110505

Out[680]= 0.154369

In[681]:=
```
Max[onsetAoLListrenum[[All, 1, 2]]]
Max[ssAoLListrenum[[All, 1, 2]]]
```

Out[681]= 0.391498

Out[682]= 0.531762

In[683]:=
```
Min[Table[ssAoLListrenum[[n, 1, 2]] / onsetAoLListrenum[[n, 1, 2]],
  {n, 1, Length[ssAoLListrenum]}]]
Max[Table[ssAoLListrenum[[n, 1, 2]] / onsetAoLListrenum[[n, 1, 2]],
  {n, 1, Length[ssAoLListrenum]}]]
```

Out[683]= 0.860208

Out[684]= 2.49625

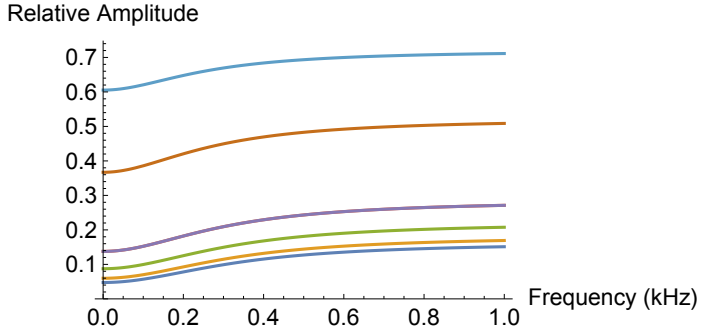
In[685]:=
```
(*Displacement stimulus*)
```

In[686]:=
```
harmsln = Solve[{KA1v * Y1 + gammaA1v * I * w * Y1 + K1v * (Y1 - Y0) - K2v * (Y2 - Y1) +
     gamma1v * (I * w * Y1 - I * w * Y0) - gamma2v * (I * w * Y2 - I * w * Y1) == 0,
   KA2v * Y2 + gammaA2v * I * w * Y2 + K2v * (Y2 - Y1) - K3v * (Y3 - Y2) +
     gamma2v * (I * w * Y2 - I * w * Y1) - gamma3v * (I * w * Y3 - I * w * Y2) == 0,
   KA3v * Y3 + gammaA3v * I * w * Y3 + K3v * (Y3 - Y2) - K4v * (Y4 - Y3) +
     gamma3v * (I * w * Y3 - I * w * Y2) - gamma4v * (I * w * Y4 - I * w * Y3) == 0,
   KA4v * Y4 + gammaA4v * I * w * Y4 + K4v * (Y4 - Y3) - K5v * (Y5 - Y4) +
     gamma4v * (I * w * Y4 - I * w * Y3) - gamma5v * (I * w * Y5 - I * w * Y4) == 0,
   KA5v * Y5 + gammaA5v * I * w * Y5 + K5v * (Y5 - Y4) - K6v * (Y6 - Y5) +
     gamma5v * (I * w * Y5 - I * w * Y4) - gamma6v * (I * w * Y6 - I * w * Y5) == 0,
   KA6v * Y6 + gammaA6v * I * w * Y6 + K6v * (Y6 - Y5) - K7v * (Y7 - Y6) +
     gamma6v * (I * w * Y6 - I * w * Y5) - gamma7v * (I * w * Y7 - I * w * Y6) == 0,
   KA7v * Y7 + gammaA6v * I * w * Y7 + K7v * (Y7 - Y6) + gamma7v * (I * w * Y7 - I * w * Y6) == 0},
  {Y1, Y2, Y3, Y4, Y5, Y6, Y7}];
```

In[687]:=
```
Y1harmf[w_, Y0_] := Evaluate[Y1 /. harmsln[[1]]]
Y2harmf[w_, Y0_] := Evaluate[Y2 /. harmsln[[1]]]
Y3harmf[w_, Y0_] := Evaluate[Y3 /. harmsln[[1]]]
Y4harmf[w_, Y0_] := Evaluate[Y4 /. harmsln[[1]]]
Y5harmf[w_, Y0_] := Evaluate[Y5 /. harmsln[[1]]]
Y6harmf[w_, Y0_] := Evaluate[Y6 /. harmsln[[1]]]
Y7harmf[w_, Y0_] := Evaluate[Y7 /. harmsln[[1]]]
```

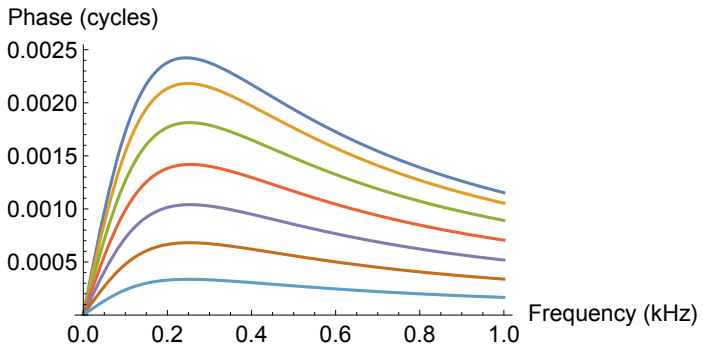
In[694]:=
```
Plot[{Abs[Y7harmf[2 * Pi * f, Y0v]] / Y0v, Abs[Y6harmf[2 * Pi * f, Y0v]] / Y0v,
  Abs[Y5harmf[2 * Pi * f, Y0v]] / Y0v, Abs[Y4harmf[2 * Pi * f, Y0v]] / Y0v,
  Abs[Y4harmf[2 * Pi * f, Y0v]] / Y0v, Abs[Y2harmf[2 * Pi * f, Y0v]] / Y0v,
  Abs[Y1harmf[2 * Pi * f, Y0v]] / Y0v}, {f, 0, 1}, PlotRange → {0, All},
 AxesLabel → {"Frequency (kHz)", "Relative Amplitude"},
 AxesStyle → Directive[Black, FontSize → 12]]
```

Out[694]=



In[695]:=
```
Plot[{Arg[Y7harmf[2 * Pi * f, Y0v]] / Y0v,
  Arg[Y6harmf[2 * Pi * f, Y0v]] / Y0v, Arg[Y5harmf[2 * Pi * f, Y0v]] / Y0v,
  Arg[Y4harmf[2 * Pi * f, Y0v]] / Y0v, Arg[Y3harmf[2 * Pi * f, Y0v]] / Y0v,
  Arg[Y2harmf[2 * Pi * f, Y0v]] / Y0v, Arg[Y1harmf[2 * Pi * f, Y0v]] / Y0v}, {f, 0, 1},
 PlotRange → {0, All}, AxesLabel → {"Frequency (kHz)", "Phase (cycles)"},
 AxesStyle → Directive[Black, FontSize → 12]]
```

Out[695]=



In[696]:=
```
KAv / KLv
gammaAv / gammaLv
(KAv / KLv) / (gammaAv / gammaLv)
```

Out[696]= 0.258281

Out[697]= 0.113523

Out[698]= 2.27514

In[699]:=
```
(*Low frequency determined by KAv/KLv and
 high frequency determined by gammaAv/gammaLv*)
(*Ratio of Y7 to input Y0*)
YPW[KAv / KLv, 8, ntotv, Y0v] / Y0v
Abs[Y7harmf[2 * Pi * 0, Y0v]] / Y0v
YPW[gammaAv / gammaLv, 8, ntotv, Y0v] / Y0v
Abs[Y7harmf[2 * Pi * 1000, Y0v]] / Y0v
```

Out[699]= 0.047462

Out[700]= 0.047462

Out[701]= 0.162909

Out[702]= 0.162909

In[703]:=
```
(*Maximum 1/AoL across all stereocilia*)
1 / Min[Table[onsetAoLListrenum[[n, 1, 2]], {n, 1, Length[ssAoLListrenum]}]]
1 / Min[Table[ssAoLListrenum[[n, 1, 2]], {n, 1, Length[ssAoLListrenum]}]]
```

Out[703]= 9.04939

Out[704]= 6.478

In[705]:=
```
(*Use wingindexrenum = 31 for wingindexnum2 = 37*)
```

In[706]:=
```
wingindexrenum2 = 31;
```

In[707]:=
```
(*Relative displacements within example wing*)
Table[YPW[onsetAoLListrenum[[wingindexrenum2, 1, 2]],
  m, ssnstereoListrenum[[wingindexrenum2]], 1],
 {m, 2, ssnstereoListrenum[[wingindexrenum2]]}]
```

Out[707]=
```
{0.71952, 0.520721, 0.381037, 0.284609, 0.220491, 0.181403, 0.162909}
```

In[708]:=
```
(*Relative displacements for all wings*)
relonset =
  Table[Table[YPW[onsetAoLListrenum[[n, 1, 2]], m, onsetnstereoListrenum[[n]], 1],
    {m, 2, ssnstereoListrenum[[n]]}], {n, 1, Length[ssAoLListrenum]}];
relss = Table[Table[YPW[ssAoLListrenum[[n, 1, 2]], m, ssnstereoListrenum[[n]], 1],
    {m, 2, ssnstereoListrenum[[n]]}], {n, 1, Length[ssAoLListrenum]}];
```

In[710]:=
```
Max[relonset]
Min[relonset]
Max[relss]
Min[relss]
Mean[Flatten[{Flatten[relonset], Flatten[relss]}]]
```

Out[710]=
```
0.72069
```

Out[711]=
```
0.0111593
```

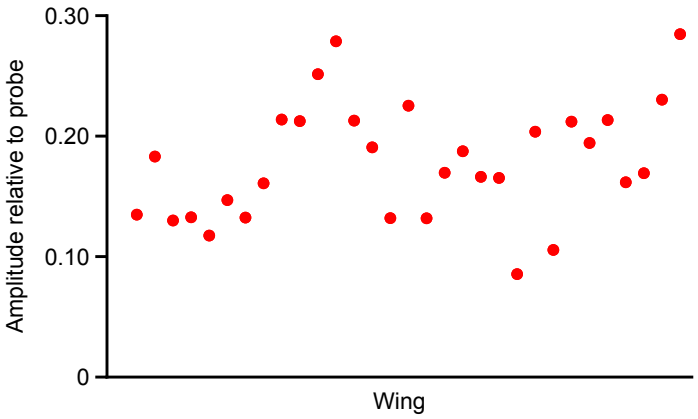
Out[712]=
```
0.677825
```

Out[713]=
```
0.00492661
```

Out[714]=
```
0.236265
```

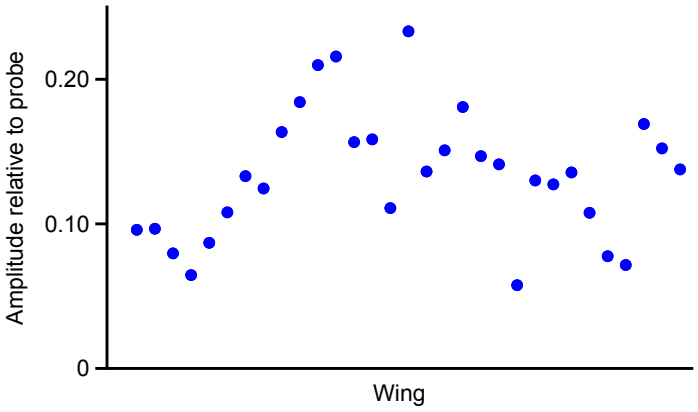
In[715]:=
```
(*Stereocilium 5's high-frequency amplitude relative to probe*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 1;
Xmax = 31;
Ymin = 0;
Ymax = 1;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Ymin, Ymax, 1 * 10^-1}];
ListPlot[
 Table[{{n, YPW[onsetAoLListrenum[[n, 1, 2]], 5, onsetnstereoListrenum[[n]], 1]}},
  {n, 1, Length[onsetAoLListrenum]}], PlotRange → {Ymin, 0.3},
 PlotStyle → {{Red, Thickness[Linewidth], PointSize[0.02]}},
 Frame → {{True, False}, {True, False}}, FrameTicks → {None, YTicks},
 FrameLabel → {"Wing", "Amplitude relative to probe"}, Joined → False,
 FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}},
   {{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]
```

Out[722]=



In[723]:=
```
(*Stereocilium 5's low-frequency amplitude relative to probe*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 1;
Xmax = 31;
Ymin = 0;
Ymax = 1;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Ymin, Ymax, 1 * 10^-1}];
ListPlot[Table[{{n, YPW[ssAoLListrenum[[n, 1, 2]], 5, ssnstereoListrenum[[n]], 1]}},
  {n, 1, Length[ssAoLListrenum]}], PlotRange → {Ymin, 0.25},
 PlotStyle → {{Blue, Thickness[Linewidth], PointSize[0.02]}},
 Frame → {{True, False}, {True, False}}, FrameTicks → {None, YTicks},
 FrameLabel → {"Wing", "Amplitude relative to probe"}, Joined → False,
 FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}},
   {{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]
```

Out[730]=



In[731]:=
```
(*Range of high to low frequency ratios for the example wing*)
Max[Table[YPW[onsetAoLListrenum[[wingindexrenum2, 1, 2]],
    m, ssnstereoListrenum[[wingindexrenum2]], 1] / YPW[ssAoLListrenum[
     wingindexrenum2, 1, 2]], m, ssnstereoListrenum[[wingindexrenum2]], 1],
  {m, 2, ssnstereoListrenum[[wingindexrenum2]]}]]
Min[Table[YPW[onsetAoLListrenum[[wingindexrenum2, 1, 2]],
    m, ssnstereoListrenum[[wingindexrenum2]], 1] / YPW[ssAoLListrenum[
     wingindexrenum2, 1, 2]], m, ssnstereoListrenum[[wingindexrenum2]], 1],
  {m, 2, ssnstereoListrenum[[wingindexrenum2]]}]]
```

Out[731]= 3.43242

Out[732]= 1.18864

In[733]:=
```
(*Number and fraction of stereocilia in 31 wings with high_freq > fac*low_freq*)
fac = 2;
wingsize = Max[ssnstereoListrenum];
Sum[Count[Table[If[ssnstereoListrenum[[n]] ≥ m,
     YPW[onsetAoLListrenum[[n, 1, 2]], m, ssnstereoListrenum[[n]], 1] /
       YPW[ssAoLListrenum[[n, 1, 2]], m, ssnstereoListrenum[[n]], 1] > fac, 0],
    {m, 2, wingsize}], True], {n, 1, Length[ssAoLListrenum]}]
N[Sum[Count[Table[If[ssnstereoListrenum[[n]] ≥ m,
       YPW[onsetAoLListrenum[[n, 1, 2]], m, ssnstereoListrenum[[n]], 1] /
         YPW[ssAoLListrenum[[n, 1, 2]], m, ssnstereoListrenum[[n]], 1] > fac, 0],
      {n, 1, Length[ssAoLListrenum]}], True], {m, 2, wingsize}] /
  Sum[Count[Table[If[ssnstereoListrenum[[n]] ≥ m, True, 0], {m, 2, wingsize}], True],
   {n, 1, Length[ssAoLListrenum]}]]
```

Out[735]= 26

Out[736]= 0.124402

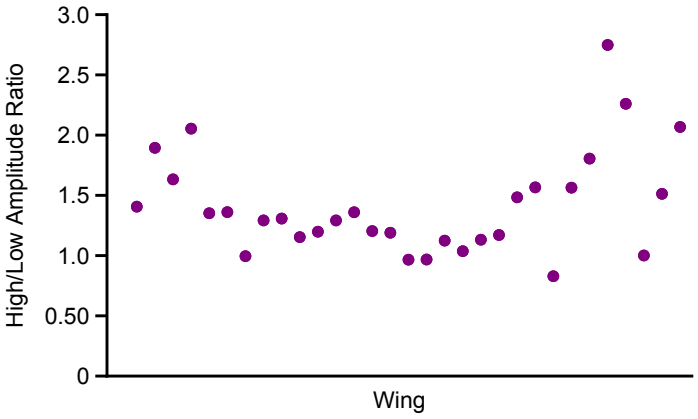
In[737]:=
```
(*Stereocilium 5*)
(*Max and min (high freq)/(low freq) ratio*)
fac = 2;
Max[Table[YPW[onsetAoLListrenum[[n, 1, 2]], 5, ssnstereoListrenum[[n]], 1] /
    YPW[ssAoLListrenum[[n, 1, 2]], 5, ssnstereoListrenum[[n]], 1],
  {n, 1, Length[ssAoLListrenum]}]]
Min[Table[YPW[onsetAoLListrenum[[n, 1, 2]], 5, ssnstereoListrenum[[n]], 1] /
    YPW[ssAoLListrenum[[n, 1, 2]], 5, ssnstereoListrenum[[n]], 1],
  {n, 1, Length[ssAoLListrenum]}]]
(*Number of stereocilia with a high/low > fac*)
Count[Table[YPW[onsetAoLListrenum[[n, 1, 2]], 5, ssnstereoListrenum[[n]], 1] /
    YPW[ssAoLListrenum[[n, 1, 2]], 5, ssnstereoListrenum[[n]], 1] > fac,
  {n, 1, Length[ssAoLListrenum]}], True]
(*Stereocilium 5's ratio of high frequency to low frequency amplitudes*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 1;
Xmax = 31;
Ymin = 0;
Ymax = 3;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Ymin, Ymax, 5 * 10^-1}];
ListPlot[Table[{{n, YPW[onsetAoLListrenum[[n, 1, 2]], 5, ssnstereoListrenum[[n]], 1] /
     YPW[ssAoLListrenum[[n, 1, 2]], 5, ssnstereoListrenum[[n]], 1]}},
  {n, 1, Length[ssAoLListrenum]}], PlotRange → {Ymin, Ymax},
 PlotStyle → {{Purple, Thickness[Linewidth], PointSize[0.02]}},
 Frame → {{True, False}, {True, False}}, FrameTicks → {None, YTicks},
 FrameLabel → {"Wing", "High/Low Amplitude Ratio"}, Joined → False,
 FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}},
   {{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]
```

Out[738]= 2.74821

Out[739]= 0.828776

Out[740]= 4

Out[748]=

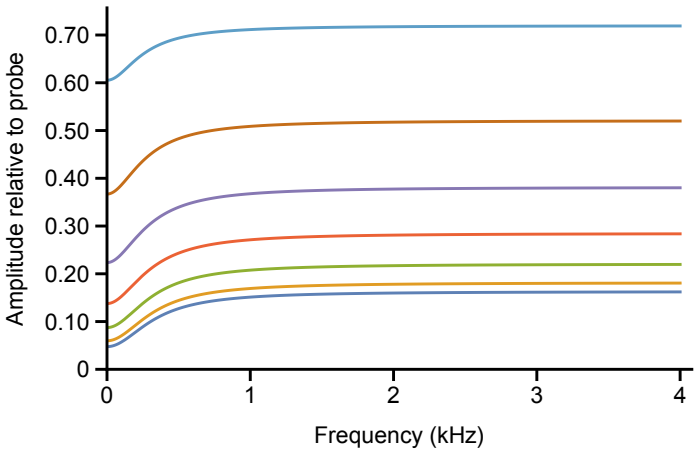


In[749]:=

```
(*Ampl relative to displaced probe*)
YsinRelYs[ntot_, n_, KL_, KA_, gammaL_, gammaA_, w_] :=
 g[ntot - n - 1, (KA + I * w * gammaA) / (KL + I * w * gammaL), 1] /
  g[ntot - 1, (KA + I * w * gammaA) / (KL + I * w * gammaL), 1]
```

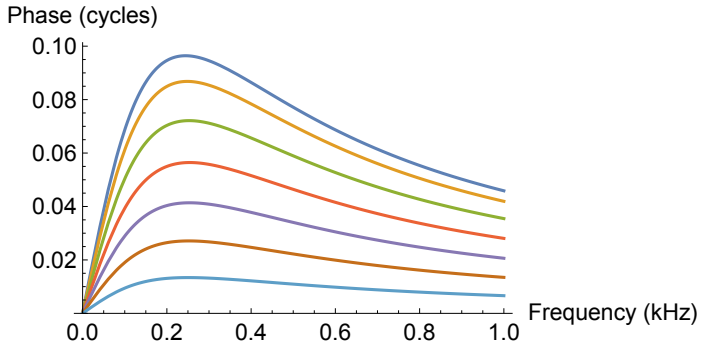
In[750]:=
```
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = 4;
Ymin = 0;
Ymax = 1;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Ymin, Ymax, 1 * 10^-1}];
Plot[{Abs[YsinRelYs[ntotv, 7, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]],
  Abs[YsinRelYs[ntotv, 6, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]],
  Abs[YsinRelYs[ntotv, 5, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]],
  Abs[YsinRelYs[ntotv, 4, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]],
  Abs[YsinRelYs[ntotv, 3, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]],
  Abs[YsinRelYs[ntotv, 2, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]],
  Abs[YsinRelYs[ntotv, 1, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]]}, {f, 0, 4},
 PlotRange → {{0, All}, {0, All}}, PlotStyle → {{Thickness[Linewidth]}},
 Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
 FrameLabel → {"Frequency (kHz)", "Amplitude relative to probe"},
 FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}},
   {{Black, Thickness[Linewidth], FontSize → Fontsize},
    {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]
```

Out[757]=



In[758]:=
```
(*Phase rel to displaced probe*)
Plot[{Arg[YsinRelYs[ntotv, 7, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]] / (2 * Pi),
  Arg[YsinRelYs[ntotv, 6, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]] / (2 * Pi),
  Arg[YsinRelYs[ntotv, 5, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]] / (2 * Pi),
  Arg[YsinRelYs[ntotv, 4, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]] / (2 * Pi),
  Arg[YsinRelYs[ntotv, 3, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]] / (2 * Pi),
  Arg[YsinRelYs[ntotv, 2, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]] / (2 * Pi),
  Arg[YsinRelYs[ntotv, 1, KLv, KAv, gammaLv, gammaAv, 2 * Pi * f]] / (2 * Pi)}, {f, 0, 1},
 PlotRange → {0, All}, AxesLabel → {"Frequency (kHz)", "Phase (cycles)"},
 AxesStyle → Directive[Black, FontSize → 12]]
```

Out[758]=



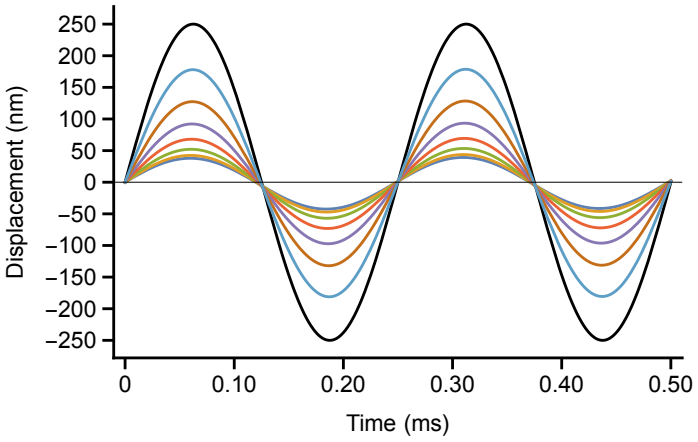
In[759]:=
```
(*Response of representative wing to 4 kHz displacement of probe*)
fv = 4; (*kHz*)
trange = 2 / fv; (*ms*)
omegav = 2 * Pi * fv;
Y0f[t_] := Y0v * Evaluate[Sin[omegav * t]]
Ysln =
 NDSolve[{KA1v * Y1[t] + gammaA1v * Y1'[t] + K1v * (Y1[t] - Y0f[t]) - K2v * (Y2[t] - Y1[t]) +
     gamma1v * (Y1'[t] - Y0f'[t]) - gamma2v * (Y2'[t] - Y1'[t]) == 0, Y1[0] == 0,
   KA2v * Y2[t] + gammaA2v * Y2'[t] + K2v * (Y2[t] - Y1[t]) - K3v * (Y3[t] - Y2[t]) +
     gamma2v * (Y2'[t] - Y1'[t]) - gamma3v * (Y3'[t] - Y2'[t]) == 0, Y2[0] == 0,
   KA3v * Y3[t] + gammaA3v * Y3'[t] + K3v * (Y3[t] - Y2[t]) - K4v * (Y4[t] - Y3[t]) +
     gamma3v * (Y3'[t] - Y2'[t]) - gamma4v * (Y4'[t] - Y3'[t]) == 0, Y3[0] == 0,
   KA4v * Y4[t] + gammaA4v * Y4'[t] + K4v * (Y4[t] - Y3[t]) - K5v * (Y5[t] - Y4[t]) +
     gamma4v * (Y4'[t] - Y3'[t]) - gamma5v * (Y5'[t] - Y4'[t]) == 0, Y4[0] == 0,
   KA5v * Y5[t] + gammaA5v * Y5'[t] + K5v * (Y5[t] - Y4[t]) - K6v * (Y6[t] - Y5[t]) +
     gamma5v * (Y5'[t] - Y4'[t]) - gamma6v * (Y6'[t] - Y5'[t]) == 0, Y5[0] == 0,
   KA6v * Y6[t] + gammaA6v * Y6'[t] + K6v * (Y6[t] - Y5[t]) - K7v * (Y7[t] - Y6[t]) +
     gamma6v * (Y6'[t] - Y5'[t]) - gamma7v * (Y7'[t] - Y6'[t]) == 0, Y6[0] == 0,
   KA7v * Y7[t] + gammaA7v * Y7'[t] + K7v * (Y7[t] - Y6[t]) + gamma7v * (Y7'[t] - Y6'[t]) ==
    0, Y7[0] == 0}, {Y1, Y2, Y3, Y4, Y5, Y6, Y7}, {t, 0, trange}]
Y1f[t_] := Evaluate[Y1[t] /. Ysln[[1]]]
Y2f[t_] := Evaluate[Y2[t] /. Ysln[[1]]]
Y3f[t_] := Evaluate[Y3[t] /. Ysln[[1]]]
```

```
Y4f[t_] := Evaluate[Y4[t] /. Ysln[[1]]]
Y5f[t_] := Evaluate[Y5[t] /. Ysln[[1]]]
Y6f[t_] := Evaluate[Y6[t] /. Ysln[[1]]]
Y7f[t_] := Evaluate[Y7[t] /. Ysln[[1]]]
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = trange;
Ymin = -Y0v;
Ymax = Y0v;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 1 * 10^-1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 5 * 10^1}];
(*Stimulus and responses*)
Show[Plot[{Y0f[t]}, {t, 0, trange},
  PlotStyle → {Thickness[Linewidth], Black}, Frame → {{True, False}, {True, False}},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → True],
 Plot[{Y7f[t], Y6f[t], Y5f[t], Y4f[t], Y3f[t], Y2f[t], Y1f[t]}, {t, 0, trange},
  PlotStyle → Thickness[Linewidth], Frame → {{True, False}, {True, False}},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
Show[Plot[{Y0f[t]}, {t, 0.95 / fv, 1.05 / fv},
  PlotStyle → {Thickness[Linewidth], Black}, Frame → {{True, False}, {True, False}},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 Plot[{Y7f[t], Y6f[t], Y5f[t], Y4f[t], Y3f[t], Y2f[t], Y1f[t]}, {t, 0, trange},
  PlotStyle → Thickness[Linewidth], Frame → {{True, False}, {True, False}},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
```

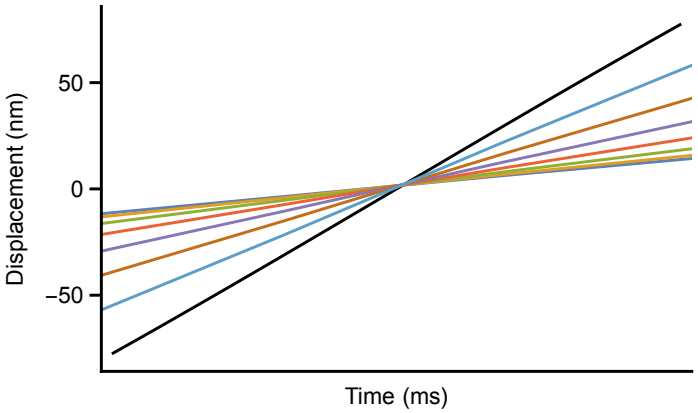
Out[761]=

```
{{Y1 → InterpolatingFunction[ Domain: {{0., 0.5 }}
                              Output: scalar ],
  Y2 → InterpolatingFunction[ Domain: {{0., 0.5 }}
                              Output: scalar ],
  Y3 → InterpolatingFunction[ Domain: {{0., 0.5 }}
                              Output: scalar ],
  Y4 → InterpolatingFunction[ Domain: {{0., 0.5 }}
                              Output: scalar ],
  Y5 → InterpolatingFunction[ Domain: {{0., 0.5 }}
                              Output: scalar ],
  Y6 → InterpolatingFunction[ Domain: {{0., 0.5 }}
                              Output: scalar ],
  Y7 → InterpolatingFunction[ Domain: {{0., 0.5 }}
                              Output: scalar ]}}
```

Out[776]=



Out[777]=



In[778]:=
```
(*Delay in ms*)
FindRoot[Y0f[t] == 0, {t, 0.1}]
FindRoot[Y1f[t] == 0, {t, 0.1}]
FindRoot[Y2f[t] == 0, {t, 0.1}]
FindRoot[Y3f[t] == 0, {t, 0.1}]
FindRoot[Y4f[t] == 0, {t, 0.1}]
FindRoot[Y5f[t] == 0, {t, 0.1}]
FindRoot[Y6f[t] == 0, {t, 0.1}]
FindRoot[Y7f[t] == 0, {t, 0.1}]
(*Maximum phase delay*)
(t /. FindRoot[Y0f[t] == 0, {t, 0.1}]) - (t /. FindRoot[Y7f[t] == 0, {t, 0.1}])
```

Out[778]= $\{t \to 0.125\}$

Out[779]= $\{t \to 0.124202\}$

Out[780]= $\{t \to 0.123389\}$

Out[781]= $\{t \to 0.122553\}$

Out[782]= $\{t \to 0.121699\}$

Out[783]= $\{t \to 0.120863\}$

Out[784]= $\{t \to 0.120146\}$

Out[785]= $\{t \to 0.119714\}$

Out[786]= 0.00528617

In[787]:=
```
(*Frog pivots and connectors (Kozlov11 SI) in IHC bundle*)
lambdas = 0.5 * 10^-9;(*N.s/m, page 37*)
Lmax = 7.8 * 10^-6;(*m*)
Lmin = 3.25 * 10^-6;(*m*)
lambdathetamin = lambdas * Lmin^2
lambdathetamax = lambdas * Lmax^2
LIHC = 5 * 10^-6;(*Nam15*)
lambdasmin = lambdathetamin / LIHC^2
lambdasmax = lambdathetamax / LIHC^2
lambdacmin = 10^3 * 10^-9;
lambdacmax = 10^4 * 10^-9;
lambdasOlambdacmax = lambdasmax / lambdacmin
lambdasOlambdacmin = lambdasmin / lambdacmax
```

Out[790]= 5.28125×10^{-21}

Out[791]= 3.042×10^{-20}

Out[793]= 2.1125×10^{-10}

Out[794]= 1.2168×10^{-9}

Out[797]= 0.0012168

Out[798]= 0.000021125

In[799]:=
```
(*Frog pivots and connectors (Kozlov11 SI) in IHC bundle*)
Ks = 0.3 * 10^-6; (*N.s/m, page 37*)
Kthetamin = Ks * Lmin^2
Kthetamax = Ks * Lmax^2
Ksmin = Kthetamin / LIHC^2
Ksmax = Kthetamax / LIHC^2
Kc = 20 * 10^-3;
KsOKcmax = Ksmax / Kc
KsOKcmin = Ksmin / Kc
```

Out[799]= 3.16875×10^{-18}

Out[800]= 1.8252×10^{-17}

Out[801]= 1.2675×10^{-7}

Out[802]= 7.3008×10^{-7}

Out[804]= 0.000036504

Out[805]= 6.3375×10^{-6}

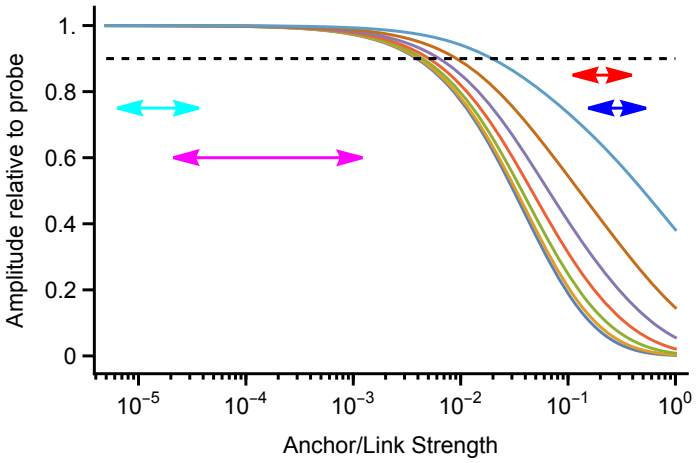
In[806]:=
```
(*How much stronger are IHC links vs frog links?*)
{Max[onsetAoLListrenum[[All, 1, 2]]] / lambdasOlambdacmin,
 Min[onsetAoLListrenum[[All, 1, 2]]] / lambdasOlambdacmax}
{Max[ssAoLListrenum[[All, 1, 2]]] / KsOKcmin, Min[ssAoLListrenum[[All, 1, 2]]] / KsOKcmax}
```

Out[806]= {18 532.4, 90.8158}

Out[807]= {83 907.2, 4228.81}

In[808]:=
```
(*Yn relative to Y0 as a function of AoL ratio*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 10^-6;
XpowMin = MantissaExponent[Xmin][[2]] - 1;
Xmax = 10^0;
XpowMax = MantissaExponent[Xmax][[2]] + 1;
Ymin = 0;
Ymax = 1;
BottomTicks =
  Table[{10^i, Superscript[10, i], {0, TickLength}}, {i, XpowMin, XpowMax, 1}];
XminorTicks = Flatten[Table[{j * 10^i, Null, {0, TickLength / 2}, Thickness[0.005]},
    {i, XpowMin, XpowMax, 1}, {j, 1, 9, 1}], 1];
XTicks = Table[{i, N[i, 1], {0, TickLength}}, {i, Xmin, Xmax, 1 * 10^-1}];
YTicks = Table[{i, N[i, 1], {0, TickLength}}, {i, Ymin, Ymax, 2 * 10^-1}];
Show[LogLinearPlot[{YPW[AoL, 8, ntotv, Y0v] / Y0v, YPW[AoL, 7, ntotv, Y0v] / Y0v,
   YPW[AoL, 6, ntotv, Y0v] / Y0v, YPW[AoL, 5, ntotv, Y0v] / Y0v,
   YPW[AoL, 4, ntotv, Y0v] / Y0v, YPW[AoL, 3, ntotv, Y0v] / Y0v,
   YPW[AoL, 2, ntotv, Y0v] / Y0v}, {AoL, 5 * Xmin, Xmax}, PlotRange → All,
  PlotStyle → Thickness[Linewidth], Frame → {{True, False}, {True, False}},
  FrameLabel → {"Anchor/Link Strength", "Amplitude relative to probe"},
  FrameTicks → {{YTicks, YTicks}, {Join[BottomTicks, XminorTicks], XTicks}},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 LogLinearPlot[0.9, {AoL, 5 * Xmin, Xmax}, PlotRange → All,
  AxesLabel → {"Ratio", "Relative Amplitude"},
  AxesStyle → Directive[Black, FontSize → 12], PlotStyle → {Black, Dashed}],
 Graphics[{Thickness[Linewidth], Blue, Arrowheads[{-0.04, 0.04}],
   Arrow[{{Log[Min[ssAoLListrenum[[All, 1, 2]]]], 0.75},
     {Log[Max[ssAoLListrenum[[All, 1, 2]]]], 0.75}}]}],
 Graphics[{Thickness[Linewidth], Red, Arrowheads[{-0.04, 0.04}],
   Arrow[{{Log[Min[onsetAoLListrenum[[All, 1, 2]]]], 0.85},
     {Log[Max[onsetAoLListrenum[[All, 1, 2]]]], 0.85}}]}],
 Graphics[{Thickness[Linewidth], Cyan, Arrowheads[{-0.04, 0.04}],
   Arrow[{{Log[KsOKcmin], 0.75}, {Log[KsOKcmax], 0.75}}]}],
 Graphics[{Thickness[Linewidth], Magenta, Arrowheads[{-0.04, 0.04}],
   Arrow[{{Log[lambdasOlambdacmin], 0.6}, {Log[lambdasOlambdacmax], 0.6}}]}]]
```

Out[819]=



In[820]:=
```
(*****************Ideal Step************)
```

In[821]:=
```
(*Start at begining of step. Use analytical
 peak solutions for stereocilia initial conditions.*)
ntotv = ssnstereoList[[wingindexnum2]]
Y0v = 250 (*nm*);
trange = 60;
Y0f[t_] := Y0v;
```

Out[821]= 8

In[825]:=
```
(*Doesn't work unless we use the equation simplification method*)
(*8 cilia, Y0 clamped, all cilia have rootlets.*)
KLv = 5;(*mN/m*)
KAv = ssAoLList[[wingindexnum2, 1, 2]] * KLv;
gammaLv = 0.8 * KLv;(*uN.s/m*)
gammaLv / KLv(*ms*)
gammaAv = onsetAoLList[[wingindexnum2, 1, 2]] * gammaLv;
KAoLv = KAv / KLv;
gammaAoLv = gammaAv / gammaLv;
(*Geometric mean time constant*)
taugmv = (gammaLv / KLv) *
   (g[ntotv - 1, gammaAoLv, 1] / g[ntotv - 1, KAv / KLv, 1]) ^ (1 / (ntotv - 1))
KA1v = KAv; gammaA1v = gammaAv;
KA2v = KAv; gammaA2v = gammaAv;
KA3v = KAv; gammaA3v = gammaAv;
KA4v = KAv; gammaA4v = gammaAv;
KA5v = KAv; gammaA5v = gammaAv;
KA6v = KAv; gammaA6v = gammaAv;
KA7v = KAv; gammaA7v = gammaAv;
K1v = KLv; gamma1v = gammaLv;
K2v = KLv; gamma2v = gammaLv;
K3v = KLv; gamma3v = gammaLv;
```

```
K4v = KLv; gamma4v = gammaLv;
K5v = KLv; gamma5v = gammaLv;
K6v = KLv; gamma6v = gammaLv;
K7v = KLv; gamma7v = gammaLv;
Ysln =
 NDSolve[{KA1v * Y1[t] + gammaA1v * Y1'[t] + K1v * (Y1[t] - Y0f[t]) - K2v * (Y2[t] - Y1[t]) +
     gamma1v * (Y1'[t] - Y0f'[t]) - gamma2v * (Y2'[t] - Y1'[t]) == 0,
   Y1[0] == Y[1, ntotv, gammaAoLv, Y0v], KA2v * Y2[t] + gammaA2v * Y2'[t] +
     K2v * (Y2[t] - Y1[t]) - K3v * (Y3[t] - Y2[t]) + gamma2v * (Y2'[t] - Y1'[t]) -
     gamma3v * (Y3'[t] - Y2'[t]) == 0, Y2[0] == Y[2, ntotv, gammaAoLv, Y0v],
   KA3v * Y3[t] + gammaA3v * Y3'[t] + K3v * (Y3[t] - Y2[t]) - K4v * (Y4[t] - Y3[t]) +
     gamma3v * (Y3'[t] - Y2'[t]) - gamma4v * (Y4'[t] - Y3'[t]) == 0,
   Y3[0] == Y[3, ntotv, gammaAoLv, Y0v], KA4v * Y4[t] + gammaA4v * Y4'[t] +
     K4v * (Y4[t] - Y3[t]) - K5v * (Y5[t] - Y4[t]) + gamma4v * (Y4'[t] - Y3'[t]) -
     gamma5v * (Y5'[t] - Y4'[t]) == 0, Y4[0] == Y[4, ntotv, gammaAoLv, Y0v],
   KA5v * Y5[t] + gammaA5v * Y5'[t] + K5v * (Y5[t] - Y4[t]) - K6v * (Y6[t] - Y5[t]) +
     gamma5v * (Y5'[t] - Y4'[t]) - gamma6v * (Y6'[t] - Y5'[t]) == 0,
   Y5[0] == Y[5, ntotv, gammaAoLv, Y0v], KA6v * Y6[t] + gammaA6v * Y6'[t] +
     K6v * (Y6[t] - Y5[t]) - K7v * (Y7[t] - Y6[t]) + gamma6v * (Y6'[t] - Y5'[t]) -
     gamma7v * (Y7'[t] - Y6'[t]) == 0, Y6[0] == Y[6, ntotv, gammaAoLv, Y0v],
   KA7v * Y7[t] + gammaA7v * Y7'[t] + K7v * (Y7[t] - Y6[t]) + gamma7v * (Y7'[t] - Y6'[t]) ==
    0, Y7[0] == Y[7, ntotv, gammaAoLv, Y0v]}, {Y1, Y2, Y3, Y4, Y5, Y6, Y7},
  {t, 0, trange}, Method → {"EquationSimplification" → "Residual"}]
Y1f[t_] := Evaluate[Y1[t] /. Ysln[[1]]]
Y2f[t_] := Evaluate[Y2[t] /. Ysln[[1]]]
Y3f[t_] := Evaluate[Y3[t] /. Ysln[[1]]]
Y4f[t_] := Evaluate[Y4[t] /. Ysln[[1]]]
Y5f[t_] := Evaluate[Y5[t] /. Ysln[[1]]]
Y6f[t_] := Evaluate[Y6[t] /. Ysln[[1]]]
Y7f[t_] := Evaluate[Y7[t] /. Ysln[[1]]]
(*Stimulus and responses*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 0;
Xmax = trange;
Ymin = 0;
Ymax = 250;
XTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Xmin, Xmax, 1 * 10^1}];
YTicks = Table[{i, i, {0, TickLength}}, {i, Ymin, Ymax, 5 * 10^1}];
Show[Plot[{Y0f[t]}, {t, 0, trange}, PlotRange → {Ymin - 15, Ymax + 15},
  MaxRecursion → 15, PlotStyle → {Black, Thickness[Linewidth]},
  Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
```

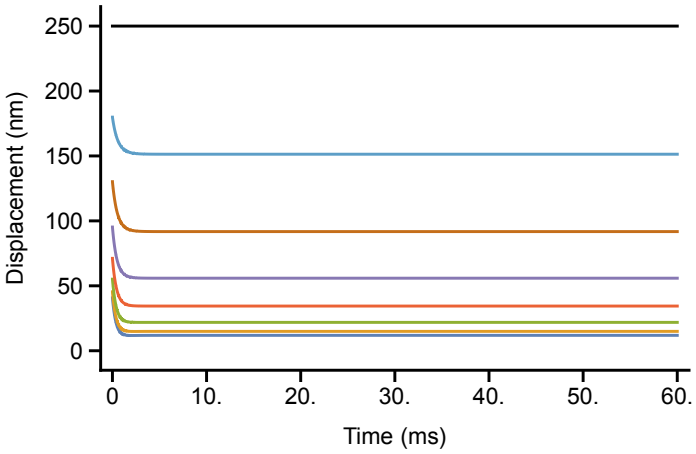
```
      {Black, Thickness[Linewidth], FontSize → Fontsize}},
     {{Black, Thickness[Linewidth], FontSize → Fontsize},
      {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 Plot[{Y7f[t], Y6f[t], Y5f[t], Y4f[t], Y3f[t], Y2f[t], Y1f[t]},
  {t, 0, trange}, MaxRecursion → 15, PlotStyle → Thickness[Linewidth],
  Frame → {{True, False}, {True, False}}, FrameTicks → {XTicks, YTicks},
  FrameLabel → {"Time (ms)", "Displacement (nm)"},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
(*Decay rates are different.*)
Y1peak = Evaluate[NMaximize[{Y1f[t], t < trange / 2, t > 0}, t][[1]];
t1peak = Evaluate[t /. NMaximize[{Y1f[t], t < trange / 2, t > 0}, t][[2]];
Y2peak = Evaluate[NMaximize[{Y2f[t], t < trange / 2, t > 0}, t][[1]];
t2peak = Evaluate[t /. NMaximize[{Y2f[t], t < trange / 2, t > 0}, t][[2]];
Y3peak = Evaluate[NMaximize[{Y3f[t], t < trange / 2, t > 0}, t][[1]];
t3peak = Evaluate[t /. NMaximize[{Y3f[t], t < trange / 2, t > 0}, t][[2]];
Y4peak = Evaluate[NMaximize[{Y4f[t], t < trange / 2, t > 0}, t][[1]];
t4peak = Evaluate[t /. NMaximize[{Y4f[t], t < trange / 2, t > 0}, t][[2]];
Y5peak = Evaluate[NMaximize[{Y5f[t], t < trange / 2, t > 0}, t][[1]];
t5peak = Evaluate[t /. NMaximize[{Y5f[t], t < trange / 2, t > 0}, t][[2]];
Y6peak = Evaluate[NMaximize[{Y6f[t], t < trange / 2, t > 0}, t][[1]];
t6peak = Evaluate[t /. NMaximize[{Y6f[t], t < trange / 2, t > 0}, t][[2]];
Y7peak = Evaluate[NMaximize[{Y7f[t], t < trange / 2, t > 0}, t][[1]];
t7peak = Evaluate[t /. NMaximize[{Y7f[t], t < trange / 2, t > 0}, t][[2]];
```

Out[828]= 0.8

Out[832]= 0.670773

Out[847]=
```
{{Y1 → InterpolatingFunction[ <Domain: {{0., 60.}} Output: scalar> ],
  Y2 → InterpolatingFunction[ <Domain: {{0., 60.}} Output: scalar> ],
  Y3 → InterpolatingFunction[ <Domain: {{0., 60.}} Output: scalar> ],
  Y4 → InterpolatingFunction[ <Domain: {{0., 60.}} Output: scalar> ],
  Y5 → InterpolatingFunction[ <Domain: {{0., 60.}} Output: scalar> ],
  Y6 → InterpolatingFunction[ <Domain: {{0., 60.}} Output: scalar> ],
  Y7 → InterpolatingFunction[ <Domain: {{0., 60.}} Output: scalar> ]}}
```

Out[862]=



In[877]:=
```
(*Find effective time constants from fitting. 1 time
 constant is sufficient. 2 time constants doesn't work.*)
```

In[878]:=
```
tauidealfit = Table[NaN, {n, 1, ntotv - 1}];
```

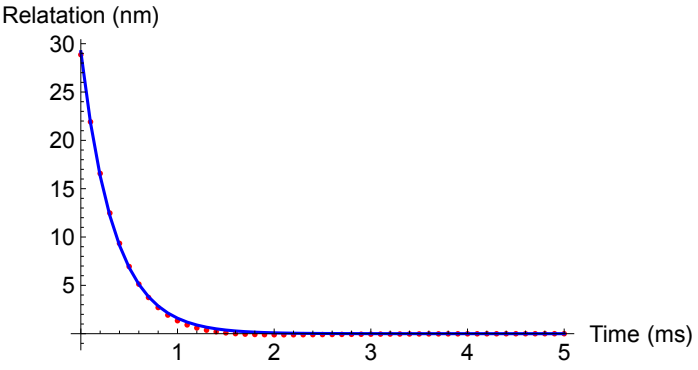
In[879]:=
```
(*Time after peak to fit*)
tfitend = 5;
```

In[880]:=
```
Yfittable = Table[{t, Y7f[t] - Y[7, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
tauidealfit[[7]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

	Estimate	Standard Error	t-Statistic	P-Value
tau	0.344467	0.00258235	133.393	2.01487 $\times 10^{-64}$
A	29.1737	0.134663	216.643	1.00474 $\times 10^{-74}$

AdjustedRSquared	0.999304
AIC	−36.6222
BIC	−30.8267
RSquared	0.999331

Out[885]=



	Estimate	Standard Error	t-Statistic	P-Value
A1	10.9851	0.0749778	146.512	3.46746 $\times 10^{-64}$
tau1	0.344467	1.22529 $\times 10^{6}$	2.81132 $\times 10^{-7}$	1.
A2	18.1886	0.0757002	240.271	2.86271 $\times 10^{-74}$
tau2	0.344467	740 022.	4.65483 $\times 10^{-7}$	1.

AdjustedRSquared	0.999274
AIC	−32.4969
BIC	−22.8378
RSquared	0.999331

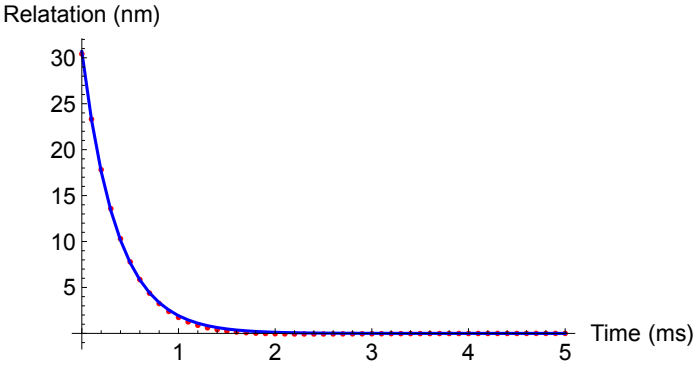
In[889]:=

```
Yfittable = Table[{t, Y6f[t] - Y[6, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
tauidealfit[[6]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

	Estimate	Standard Error	t-Statistic	P-Value
tau	0.361273	0.00195237	185.043	2.25489 $\times 10^{-71}$
A	30.6702	0.102685	298.684	1.49053 $\times 10^{-81}$

```
AdjustedRSquared 0.999637
AIC              -62.9686
BIC              -57.1731
RSquared         0.999651
```

Out[894]=



NonlinearModelFit : The step size in the search has become less than the tolerance prescribed by the PrecisionGoal option, but the gradient is larger than the tolerance specified by the AccuracyGoal option. There is a possibility that the method has stalled at a point that is not a local minimum.

	Estimate	Standard Error	t-Statistic	P-Value
A1	15.3406	0.0576319	266.182	2.33271×10^{-76}
tau1	0.361273	317449.	1.13805	$\times 10^{-6}$ 0.999999
A2	15.3296	0.0576922	265.714	2.53351×10^{-76}
tau2	0.361273	317675.	1.13724	$\times 10^{-6}$ 0.999999

```
AdjustedRSquared 0.999622
AIC              -58.8433
BIC              -49.1841
RSquared         0.999651
```

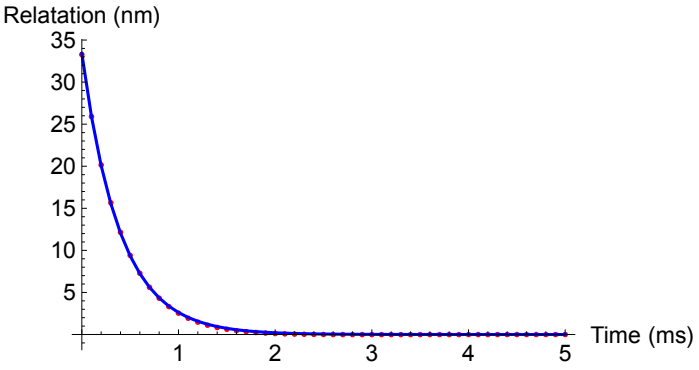
In[898]:=

```
Yfittable = Table[{t, Y5f[t] - Y[5, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
tauidealfit[[5]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

	Estimate	Standard Error	t-Statistic	P-Value
tau	0.39244	0.000952062	412.2	2.09468×10^{-88}
A	33.4018	0.0507107	658.674	2.23041×10^{-98}

```
AdjustedRSquared 0.999927
AIC              -132.564
BIC              -126.769
RSquared         0.999929
```

Out[903]=



	Estimate	Standard Error	t-Statistic	P-Value
A1	16.7002	0.027961	597.266	7.52799×10^{-93}
tau1	0.39244	635741.	6.17295	$\times 10^{-7}$ 1.
A2	16.7017	0.0294425	567.263	8.48337×10^{-92}
tau2	0.39244	635684.	6.17351	$\times 10^{-7}$ 1.

```
AdjustedRSquared 0.999923
AIC              -128.439
BIC              -118.78
RSquared         0.999929
```

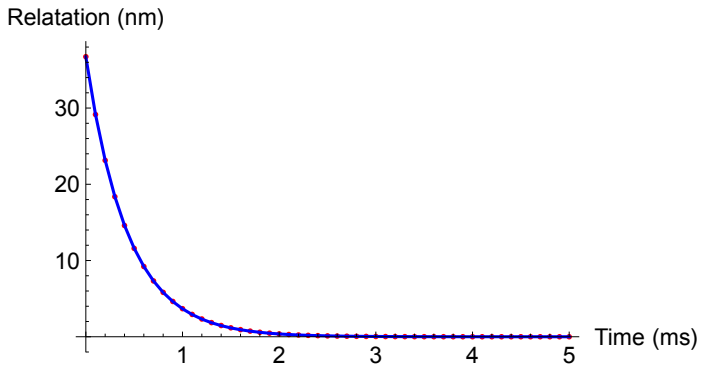
In[907]:=

```
Yfittable = Table[{t, Y4f[t] - Y[4, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
tauidealfit[[4]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

Out[912]=

	Estimate	Standard Error	t-Statistic	P-Value	
tau	0.434099	0.000132032	3287.82	1.36737	$\times 10^{-132}$
A	36.7094	0.00706658	5194.8	2.52088	$\times 10^{-142}$

```
AdjustedRSquared 0.999999
AIC              -330.533
BIC              -324.738
RSquared         0.999999
```



	Estimate	Standard Error	t-Statistic	P-Value	
A1	36.2889	0.122525	296.176	1.54779	$\times 10^{-78}$
tau1	0.436684	0.00046107	947.109	2.92799	$\times 10^{-102}$
A2	0.449512	0.121815	3.69013	0.000581485	
tau2	0.221447	0.0246223	8.99379	8.74621	$\times 10^{-12}$

```
AdjustedRSquared 1.
AIC              -434.019
BIC              -424.36
RSquared         1.
```

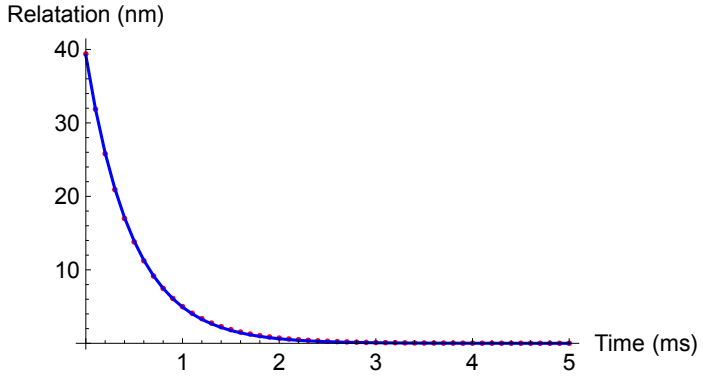
In[916]:=

```
Yfittable = Table[{t, Y3f[t] - Y[3, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
tauidealfit[[3]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

	Estimate	Standard Error	t-Statistic	P-Value	
tau	0.4825	0.00099359	485.613	6.82415	$\times 10^{-92}$
A	39.2048	0.0516483	759.073	2.13619	$\times 10^{-101}$

AdjustedRSquared	0.999947
AIC	−124.274
BIC	−118.478
RSquared	0.999949

Out[921]=



	Estimate	Standard Error	t-Statistic	P-Value	
A1	20.7137	0.16281	127.227	2.59258	$\times 10^{-61}$
tau1	0.405434	0.000594266	682.242	1.45128	$\times 10^{-95}$
A2	18.6778	0.163015	114.577	3.50438	$\times 10^{-59}$
tau2	0.570589	0.000804219	709.494	2.30334	$\times 10^{-96}$

```
AdjustedRSquared 1.
AIC              -593.299
BIC              -583.639
RSquared         1.
```

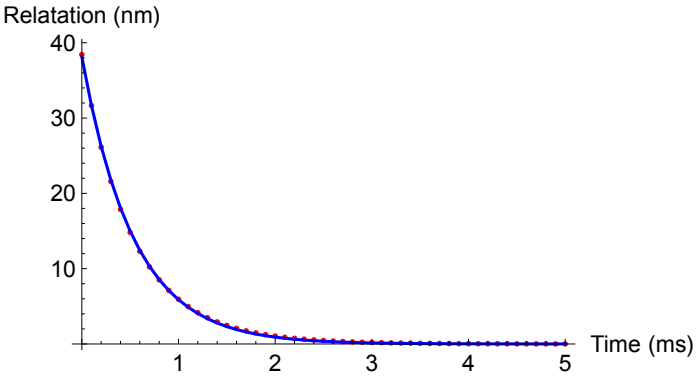
In[925]:=

```
Yfittable = Table[{t, Y2f[t] - Y[2, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
tauidealfit[[2]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

	Estimate	Standard Error	t-Statistic	P-Value	
tau	0.535071	0.00163443	327.374	1.66919	$\times 10^{-83}$
A	38.1395	0.075245	506.87	8.36542	$\times 10^{-93}$

```
AdjustedRSquared 0.999882
AIC              -82.4244
BIC              -76.629
RSquared         0.999887
```

Out[930]=



	Estimate	Standard Error	t-Statistic	P-Value	
A1	17.807	0.00920993	1933.46	7.94362	$\times 10^{-117}$
tau1	0.418685	0.0000512111	8175.67	2.94628	$\times 10^{-146}$
A2	20.6214	0.00923252	2233.56	9.01428	$\times 10^{-120}$
tau2	0.638502	0.0000564517	11310.6	6.98321	$\times 10^{-153}$

```
AdjustedRSquared 1.
AIC              -818.577
BIC              -808.918
RSquared         1.
```

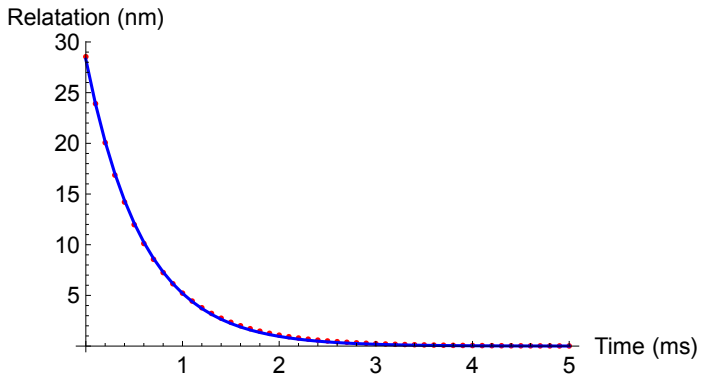
In[934]:=

```
Yfittable = Table[{t, Y1f[t] - Y[1, ntotv, KAoLv, Y0v]}, {t, 0, tfitend, 0.1}];
fit = NonlinearModelFit[Yfittable, {A * Exp[-t / tau]}, {tau, A}, t];
Print[fit["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
tauidealfit[[1]] =
  Around[(tau /. fit["BestFitParameters"]), fit["ParameterTable"][[1, 1, 2, 3]]];
Show[ListPlot[Yfittable, PlotStyle → Red,
  AxesLabel → {"Time (ms)", "Relatation (nm)"},
  AxesStyle → Directive[Black, FontSize → 12], PlotRange → All], ListPlot[Table[
   {t, (A /. fit["BestFitParameters"]) * Exp[-t / (tau /. fit["BestFitParameters"])]},
   {t, 0, tfitend, 0.1}], PlotStyle → Blue, Joined → True, PlotRange → All]]
fit2 = NonlinearModelFit[Yfittable,
   {A1 * Exp[-t / tau1] + A2 * Exp[-t / tau2]}, {A1, tau1, A2, tau2}, t];
Print[fit2["ParameterTable"]];
Print[
  Grid[Transpose[{#, fit2[#]} &[{"AdjustedRSquared", "AIC", "BIC", "RSquared"}]],
   Alignment → Left]];
```

Out[939]=

	Estimate	Standard Error	t-Statistic	P-Value	
tau	0.590515	0.00202265	291.95	4.55286	$\times 10^{-81}$
A	28.2872	0.0630983	448.304	3.4262	$\times 10^{-90}$

```
AdjustedRSquared 0.999852
AIC              -96.933
BIC              -91.1375
RSquared         0.999858
```

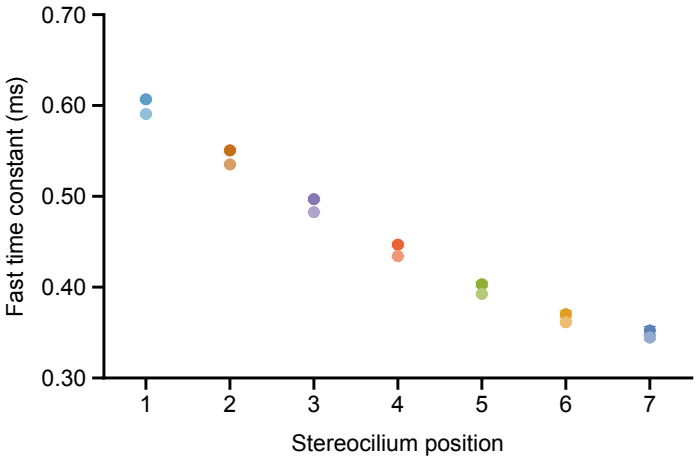


	Estimate	Standard Error	t-Statistic	P-Value	
A1	17.7792	0.0410217	433.409	2.63739	$\times 10^{-86}$
tau1	0.689035	0.000347186	1984.63	2.32721	$\times 10^{-117}$
A2	10.7672	0.0408811	263.378	3.83568	$\times 10^{-76}$
tau2	0.431007	0.00043754	985.067	4.61849	$\times 10^{-103}$

```
AdjustedRSquared 1.
AIC              -631.931
BIC              -622.272
RSquared         1.
```

In[943]:=
```
(*Stereocilium farthest from probe relaxes with the shortest time constant!*)
(*Choose gammaL/KL to match experimental time constants*)
(*Tick Marks*)
TickLength = 0.02;
Xmin = 1;
Xmax = 7;
Ymin = 0;
Ymax = 1;
XTicks = Table[{i, i, {0, TickLength}}, {i, Xmin, Xmax, 1}];
YTicks = Table[{i, N[i, 2], {0, TickLength}}, {i, Ymin, Ymax, 1 * 10^-1}];
Show[ListPlot[Reverse[Table[{{n, taufit[[n]]}}, {n, 1, ntotv - 1}]],
  PlotRange → {{Xmin - 0.5, Xmax + 0.5}, {0.3, 0.7}}, PlotStyle →
   Table[{ColorData[97, "ColorList"][[m]], PointSize[0.02]}, {m, 1, ntotv - 1}],
  IntervalMarkersStyle → Table[{ColorData[97, "ColorList"][[m]], PointSize[0.02]},
    {m, 1, ntotv - 1}], Frame → {{True, False}, {True, False}},
  FrameLabel → {"Stereocilium position", "Fast time constant (ms)"},
  FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False],
 ListPlot[Reverse[Table[{{n, tauidealfit[[n]]}}, {n, 1, ntotv - 1}]],
  PlotRange → {{Xmin - 0.5, Xmax + 0.5}, {0.4, 0.8}},
  PlotStyle → Table[{Lighter[ColorData[97, "ColorList"][[m]]], PointSize[0.02]},
    {m, 1, ntotv - 1}], IntervalMarkersStyle →
   Table[{Lighter[ColorData[97, "ColorList"][[m]]], PointSize[0.02]},
    {m, 1, ntotv - 1}], Frame → {{True, False}, {True, False}},
  FrameLabel → {"Stereocilium position", "Fast time constant (ms)"},
  FrameTicks → {{YTicks, YTicks}, {XTicks, XTicks}},
  FrameStyle → {{{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}},
    {{Black, Thickness[Linewidth], FontSize → Fontsize},
     {Black, Thickness[Linewidth], FontSize → Fontsize}}}, Axes → False]]
```

Out[950]=


0.70
0.60
0.50
0.40
0.30
Fast time constant (ms)
1
2
3
4
5
6
7
Stereocilium position