Supporting Text

We first clustered the 1,799 displacements from a sequence of 1,800 video frames by the common sign of the polar angle $\Delta\theta = \theta(\mathrm{k}+1) - \theta(\mathrm{k})$. We then calculated the sizes of the clusters, $\mathrm{Cls_k}$, and the distance of each displacement between adjacent frames, $\mathrm{d(k)} = \mathrm{r(k)}\left|\theta(\mathrm{k}+1) - \theta(\mathrm{k})\right|$. In some definitions, the corrected displacement, $\mathrm{d^C(k)}$, was used in place of $\mathrm{d(k)}$; $\mathrm{d^C(k)} = \mathrm{d(k)}$ if $\mathrm{d(k)}$ is larger than the change in the radius vector, $\left|\mathrm{r(k+1)} - \mathrm{r(k)}\right|$; otherwise, $\mathrm{d^C(k)} = 0$. The rotational coherence used in *Results* was

$$\sum^{\mathrm{Cls}>1} \sum_{\mathrm{k}=1}^{\mathrm{Cls}} \mathrm{Cls_k}^2 \times \left|\mathrm{d^C(k)}\right|.$$

We also replaced $\mathrm{d^C(k)}$ with $\mathrm{d(k)}$ and the weight $\mathrm{Cls_k}^2$ with $\mathrm{Cls_k}$ or what is minor of k and $\mathrm{Cls_k}$-k.

Alternatively, instead of summing $\mathrm{d(k)}$ or $\mathrm{d^C(k)}$ over a cluster, we summed it over 1 s, which was reported to be the lifetime of a sliding complex (1). Nine variations of rotational coherence gave essentially the same result, as shown in Fig. 4*E*.

References

1. Singer, P. T. & Wu, C.-W. (1988) *J. Biol. Chem.* **263,** 4208-4214.