***eLife’s* transparent reporting form**

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**Sample-size estimation**

* You should state whether an appropriate sample size was computed when the study was being designed
* You should state the statistical method of sample size computation and any required assumptions
* If no explicit power analysis was used, you should describe how you decided what sample (replicate) size (number) to use

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This paper describes molecular studies for which ‘sample size’ is not a relevant concern.

**Replicates**

* You should report how often each experiment was performed
* You should include a definition of biological versus technical replication
* The data obtained should be provided and sufficient information should be provided to indicate the number of independent biological and/or technical replicates
* If you encountered any outliers, you should describe how these were handled
* Criteria for exclusion/inclusion of data should be clearly stated
* High-throughput sequence data should be uploaded before submission, with a private link for reviewers provided (these are available from both GEO and ArrayExpress)

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Three replicate SEC-MALS experiments are shown in Fig. 1A and 1E, and similar results were observed during the SEC-SAXS-MALS data acquisition at EMBL-P12 bioSAXS beam line. Details of the number of measurements performed for the SEC-SAXS experiments are provided in the materials and methods, as are details of the number of *ab initio* (dummy atom) models for each scattering profile. Listing technical replicates is not appropriate for crystal structures, although we note that a great many crystals were grown during crystal optimization and for the heavy atom derivitisation experiments. Details of replicates are presented in Fig. 3 and 4. Data presented in Fig. 5 were acquired during two imaging sessions.

**Statistical reporting**

* Statistical analysis methods should be described and justified
* Raw data should be presented in figures whenever informative to do so (typically when N per group is less than 10)
* For each experiment, you should identify the statistical tests used, exact values of N, definitions of center, methods of multiple test correction, and dispersion and precision measures (e.g., mean, median, SD, SEM, confidence intervals; and, for the major substantive results, a measure of effect size (e.g., Pearson's r, Cohen's d)
* Report exact p-values wherever possible alongside the summary statistics and 95% confidence intervals. These should be reported for all key questions and not only when the p-value is less than 0.05.

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Statistical analysis of the fitted SAXS profile is described in the figure legend and cited papers. Statistical analysis to probe for the co-evolution of amino acids at the pUL7:pUL51 interface is clearly described in the methods.

(For large datasets, or papers with a very large number of statistical tests, you may upload a single table file with tests, Ns, etc., with reference to sections in the manuscript.)

**Group allocation**

* Indicate how samples were allocated into experimental groups (in the case of clinical studies, please specify allocation to treatment method); if randomization was used, please also state if restricted randomization was applied
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Not relevant for this molecular study.

**Additional data files (“source data”)**

* We encourage you to upload relevant additional data files, such as numerical data that are represented as a graph in a figure, or as a summary table
* Where provided, these should be in the most useful format, and they can be uploaded as “Source data” files linked to a main figure or table
* Include model definition files including the full list of parameters used
* Include code used for data analysis (e.g., R, MatLab)
* Avoid stating that data files are “available upon request”

Please indicate the figures or tables for which source data files have been provided:

All large data sets (SAXS, crystallography and mass spectrometry) have been deposited with the appropriate community archives. R code for the evolutionary analysis is included as a supplementary file.