Statistical analyses

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

- The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement.
- A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly.
- The statistical test(s) used AND whether they are one- or two-sided.
  - *Only common tests should be described solely by name; describe more complex techniques in the Methods section.*
- A description of all covariates tested.
- A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons.
- A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals).
- For null hypothesis testing, the test statistic (e.g. F, t, r) with confidence intervals, effect sizes, degrees of freedom and P value noted.
  - *Give P values as exact values whenever suitable.*
- For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings.
- For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes.
- Estimates of effect sizes (e.g. Cohen’s d, Pearson’s r), indicating how they were calculated.

*Our web collection on [Statistics for Biologists](https://www.nature.com/education/sb/) contains articles on many of the points above.*

Software and code

**Data collection**

- SerialEM – automated image acquisition.

**Data analysis**

- IMODE – image format conversions and gain correction.
- EMAN2 – micrograph screening and ctf estimation during data collection.
- MotionCor2 – correction of beam induced motion and radiation exposure.
- CTFFIND – estimation of ctf parameters for micrographs and particles.
- Relion – particle picking, 2D and 3D classification, an-initio alignment, 3D refinement of particle alignment, mask calculation, map sharpening.
- ResMap – local resolution estimate.
- Phenix – real space restrained refinement and validation.
- Coot – manual model building, real space refinement and validation.
- Pymol – image preparation and distance calculations.
Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☑ Life sciences  ☐ Behavioural & social sciences  ☐ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/mr-reporting-summary-flat.pdf

Life sciences study design

All studies must disclose on these points even when the disclosure is negative.

Sample size  The final particle data set contains 74220 independent views.

Data exclusions  As is practiced in cryo-EM data processing, a significant number of particles were excluded during data analysis. The number of excluded particles is clearly reported in the methods section (Supplementary figure 1).

Replication  The final analysis relies on data obtained from two biological experiments which were combined to a single dataset. Approximately 20 prior complete experiments were conducted under similar conditions yielding progressively better results in terms of the final resolution of the reconstruction.

Randomization  As implemented in Relion, the particle data set was randomly split in two groups before any 3D reconstruction, final resolution estimation is based on the correlations between these two half data sets.

Blinding  The investigators were not blinded in any way as to the identity of the sample.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

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Methods

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