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Last updated by author(s): Nov 10, 2019

Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Research policies, see Authors & Referees and the Editorial Policy Checklist .

Statistics

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

n/a	Confirmed
✘	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 contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	FEI EPU 1.10, pLink 2 (version 2.3.1)
Data analysis	RELION 3.0, Warp 1.0.6/1.0.7, UCSF Chimera (version 1.11.2), UCSF ChimeraX (version 0.91), COOT (version 0.8.9.2), PHENIX (version 1.16), PyMol (Schrödinger LLC version 1.8.4.1), Aline 1.0.025, XlinkAnalyzer 1.1.1, Namdinator (online version April 2019 - August 2019), 3D-DART (online version April 2019 - August 2019), MSAProbs (online version 0.9.7), ESPript (webserver July 2019 - August 2019), ROBETTA (online version February 2019 - August 2019), xVis (online version February 2019 - August 2019), Quick2D (online version August 2018 - August 2019), PSIPRED (online version February 2019 - July 2019), Molprobity plugin (PHENIX), XiNet (online version June 2019 - August 2019), SWISS-MODEL (online version October 2018 - August 2019), Molprobity (online version June 2019 - August 2019)

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors/reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research guidelines for submitting code & software for further information.

Data

Policy information about availability of data

All manuscripts must include a data availability statement. This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A list of figures that have associated raw data
- A description of any restrictions on data availability

The coordinate file for the RSC-nucleosome complex structure was deposited with the Protein Data Bank with accession code 6TDA. The cryo-EM density maps used for model building were all deposited with the Electron Microscopy Data Base (EMDB) with accession code EMD-10465.

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/nr-reporting-summary-flat.pdf

Life sciences study design

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

Sample size	Structural data was collected on two independently prepared samples. No statistical methods were used to predetermine the sample size. For cryo-EM, the sample sizes were determined by available electron microscopy measuring time and density of the particles on the sample grids. Statistics regarding cryo-EM analysis have all been detailed in the methods section.
Data exclusions	No data were pre-excluded from the analyses. Low quality data from cryo-EM was sorted out in RELION to reach high resolution with criteria pre-established in RELION.
Replication	Cross-linking mass spectrometry experiments were performed in duplicates with reproducible results.
Randomization	Samples were not allocated to groups.
Blinding	Investigators were not blinded during data acquisition and analysis because it is not a common procedure for the methods employed.

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

n/a	Involved in the study
☒	☐ Antibodies
☐	☒ Eukaryotic cell lines
☒	☐ Palaeontology
☒	☐ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Eukaryotic cell lines

Policy information about cell lines

Cell line source(s)	Saccharomyces cerevisiae, RSC2-TAP-HIS3 yeast strain (YSC1177-YLR357W), Dharmacon TAP-tagged open reading frame (ORF) library
Authentication	N.A.
Mycoplasma contamination	Cells were not tested for mycoplasma.
Commonly misidentified lines (See ICLAC register)	none