

## 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](#).

### Statistical parameters

When statistical analyses are reported, confirm that the following items are present in the relevant location (e.g. 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
- An indication of 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 statistics 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
- Clearly defined error bars  
*State explicitly what error bars represent (e.g.  $SD$ ,  $SE$ ,  $CI$ )*

*Our web collection on [statistics for biologists](#) may be useful.*

### Software and code

Policy information about [availability of computer code](#)

#### Data collection

Code and software for data collection is fully described in the methods section of the manuscript. In brief, the following commercial or open source software was used: Micromanager version: 1.4.16; ScanImage version 4.2, MATLAB versions 8.1-9.1; Psychopy version 1.85; ImageJ version 1.51n; MIJ version 1.3.9; Cell Magic Wand version 1.0. The code for custom visual stimuli can be made available upon request to the corresponding author.

#### Data analysis

Custom MATLAB and Python code was used for data analysis and simulations and is described in detail in Methods. In addition to the software listed above, the following commercial and open source software was used: Python versions 2.7, 3; Matplotlib version 2.0.2; Theano version 0.8.1. The following Code availability statement is contained in the manuscript: The code for data analysis and simulations can be made available upon request to the corresponding author.

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 upon request. 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 data that support the findings of this study are available from the corresponding author upon reasonable request.

## Field-specific reporting

Please select 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/authors/policies/ReportingSummary-flat.pdf](https://www.nature.com/authors/policies/ReportingSummary-flat.pdf)

## Life sciences study design

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

Sample size	No a priori sample size calculations were preformed. 5 animals or greater is an accepted sample size for in vivo imaging in carnivores such as ferrets and cats.
Data exclusions	Data were excluded as noted in methods. In brief, animals with labeled areas insufficiently large to permit correlation scale measurements (2 of 12) were excluded from the analysis of scale.
Replication	All attempts at replication were successful, and all imaged animals are reflected in the data (except as noted above).
Randomization	All comparisons were made within an experimental group (e.g. animals imaged 5+ days after eye opening, longitudinally imaged animals, LGN inactivation animals, etc.), and animals were allocated to an experimental group sequentially, in the order in which experiments were performed
Blinding	No attempts at blinding were performed in this study, as it is not possible to remain blind to animal age or eye opening status. Nor is it possible to remain blind to the pre- or post- inactivation status for retinal or LGN inactivation experiments.

## Reporting for specific materials, systems and methods

### Materials & experimental systems

n/a	Involvement in the study
<input checked="" type="checkbox"/>	<input type="checkbox"/> Unique biological materials
<input checked="" type="checkbox"/>	<input type="checkbox"/> Antibodies
<input checked="" type="checkbox"/>	<input type="checkbox"/> Eukaryotic cell lines
<input checked="" type="checkbox"/>	<input type="checkbox"/> Palaeontology
<input type="checkbox"/>	<input checked="" type="checkbox"/> Animals and other organisms
<input checked="" type="checkbox"/>	<input type="checkbox"/> Human research participants

### Methods

n/a	Involvement in the study
<input checked="" type="checkbox"/>	<input type="checkbox"/> ChIP-seq
<input checked="" type="checkbox"/>	<input type="checkbox"/> Flow cytometry
<input checked="" type="checkbox"/>	<input type="checkbox"/> MRI-based neuroimaging

## Animals and other organisms

Policy information about [studies involving animals](#); [ARRIVE guidelines](#) recommended for reporting animal research

Laboratory animals	Female ferrets age P21-47 were used in this study.
Wild animals	No wild animals were used.
Field-collected samples	No field-collected samples were used.