

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

NA

Data analysis

NA

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

Provide your data availability statement here.

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)

Ecological, evolutionary & environmental sciences study design

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

Study description	We studied ontogenetic sequences in embryos of different species of archosaurs, including birds and alligator, focusing on the ossification sequence of the skull through the use of Alizarin staining, comparing our findings with the fossil record by reviewing the literature and direct observation of key fossil specimens..
Research sample	Eggs of different bird species were collected, either from the wild (<i>Fulica armillata</i> , <i>Vanellus chilensis</i>), from commercial farms (<i>Gallus gallus</i> , <i>Anas platyrhynchos</i> , <i>Nothoprocta perdicaria</i> , <i>Alligator mississippiensis</i>) or animals bred in our facilities (<i>Melopsittacus undulatus</i>). The number of embryos obtained varied and depended on the number of fertile eggs obtained.
Sampling strategy	We tried, when possible to obtain a series of embryos as closely spaced as we were able to collect.
Data collection	Embryos collected at the appropriate stages were stained and cleared with Alizarin red and ossification pattern was observed. Specimens reflecting important stages of ossification were photographed, documenting important events on the ossification sequence.
Timing and spatial scale	Depending on the availability of eggs, two or three embryos were collected twice a day or every couple of hours.
Data exclusions	Only embryos too young for presenting ossified elements in the skull were excluded from being stained and observed
Reproducibility	We tried to collect as many embryos as possible in close and sequential developmental stages.
Randomization	Not relevant. Of the whole sample of eggs we tried to just collect the most complete series of embryos as was possible
Blinding	No blinding was performed. All embryos were stained in the same fashion to observe the ossification pattern
Did the study involve field work?	☐ Yes ☒ No

Reporting for specific materials, systems and methods

Materials & experimental systems

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

Methods

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

Unique biological materials

Policy information about [availability of materials](#)

Obtaining unique materials	Embryos represent the unique specimens used for the study. In order to study and photograph them sometimes embryos were subject to destructive sampling. Embryos are stored in Glycerol and could be still observed, although with time Alizarin tends to fade a little.
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Palaeontology

Specimen provenance	The following specimens were directly analyzed: <i>Deinonychus</i> (MOR747) partial skull at the Museum of the Rockies, Bozeman;
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Specimen provenance	Enantiornithe juvenile specimen (IVPPV15564A) at the Institute of Vertebrate Paleontology and Paleoanthropology, Beijing, China; Archaeopteryx (JM2257) at the Jura Museum in Eichstätt, Germany.
Specimen deposition	all specimens are deposited in the institutions mentioned above
Dating methods	NA

☐ Tick this box to confirm that the raw and calibrated dates are available in the paper or in Supplementary Information.

Animals and other organisms

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

Laboratory animals	Eggs from Melopsittacus undulatus were obtained from a breeding colony housed at the Universidad de Chile. Eggs were then incubated at 37,5 °C and 70% humidity in an incubator with automatic rotation.
Wild animals	Eggs of different bird species were collected, either from the wild (Fulica armillata, Vanellus chilensis), from commercial farms (Gallus gallus, Anas platyrhynchos, Nothoprocta perdicaria, Alligator mississippiensis). Avian eggs were then incubated at 37,5 °C and 70% humidity in an incubator with automatic rotation.
Field-collected samples	Eggs of different bird species were collected, either from the wild (Fulica armillata, Vanellus chilensis). Eggs were then incubated at 37,5 °C and 70% humidity in an incubator with automatic rotation.