Non-linear dimensionality reduction identifies gene expression programmes relevant to hair cell regeneration in the inner ear

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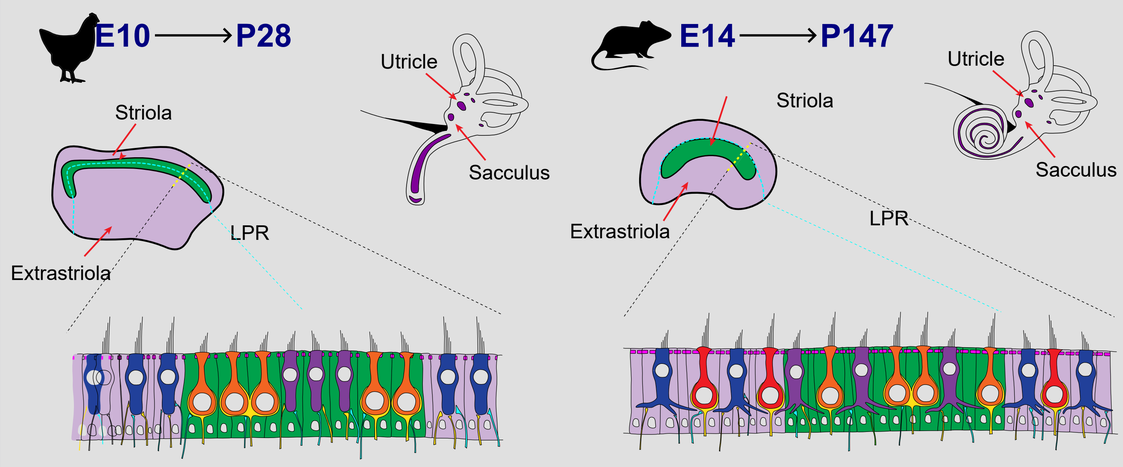
Biological context



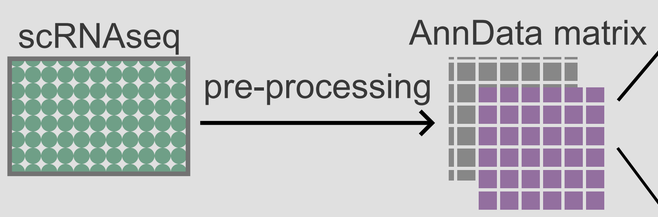
The vertebrate inner ear facilitates perception of sound, balance, and motion through the action of mechanosensory hair cells (HCs).

HCs can be regenerated through cell division and/or transdifferentiation of supporting cells (SCs) throughout life in birds. However, mammals retain only a marginal capacity to regenerate HCs postnatally.

Hypothesis: Gene expression programmes governing regenerative capacity differ between species and across maturation.
Aim: Identify subtypes of HCs and SCs in mouse and chick utricle samples and their gene expression profiles across maturation.

Workflow comparison: Linear (PCA) vs. Non-linear (DM with Topometry)

Data collection and preprocessing

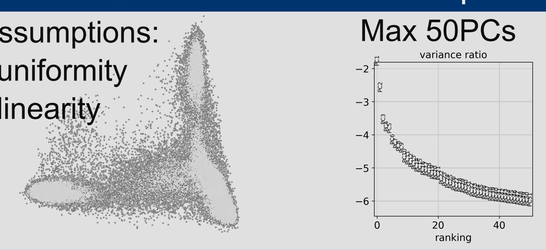


Want to know more about the experiment?

For visualisation of batch effects and summary statistics by age, **please see poster P65 by my coauthor, Jimena**.

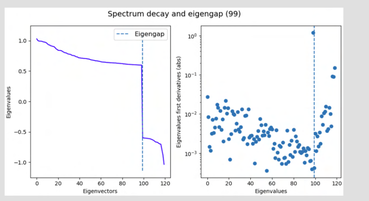
Dim. Reduction → Dim. Estimation → 2-D Projection and Leiden Clustering

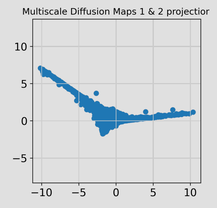
PCA	Knee plot	UMAP/tSNE	PCA based
Assumptions: - uniformity - linearity	Max 50PCs	Parameter selection & distortion	Resolution=0.5



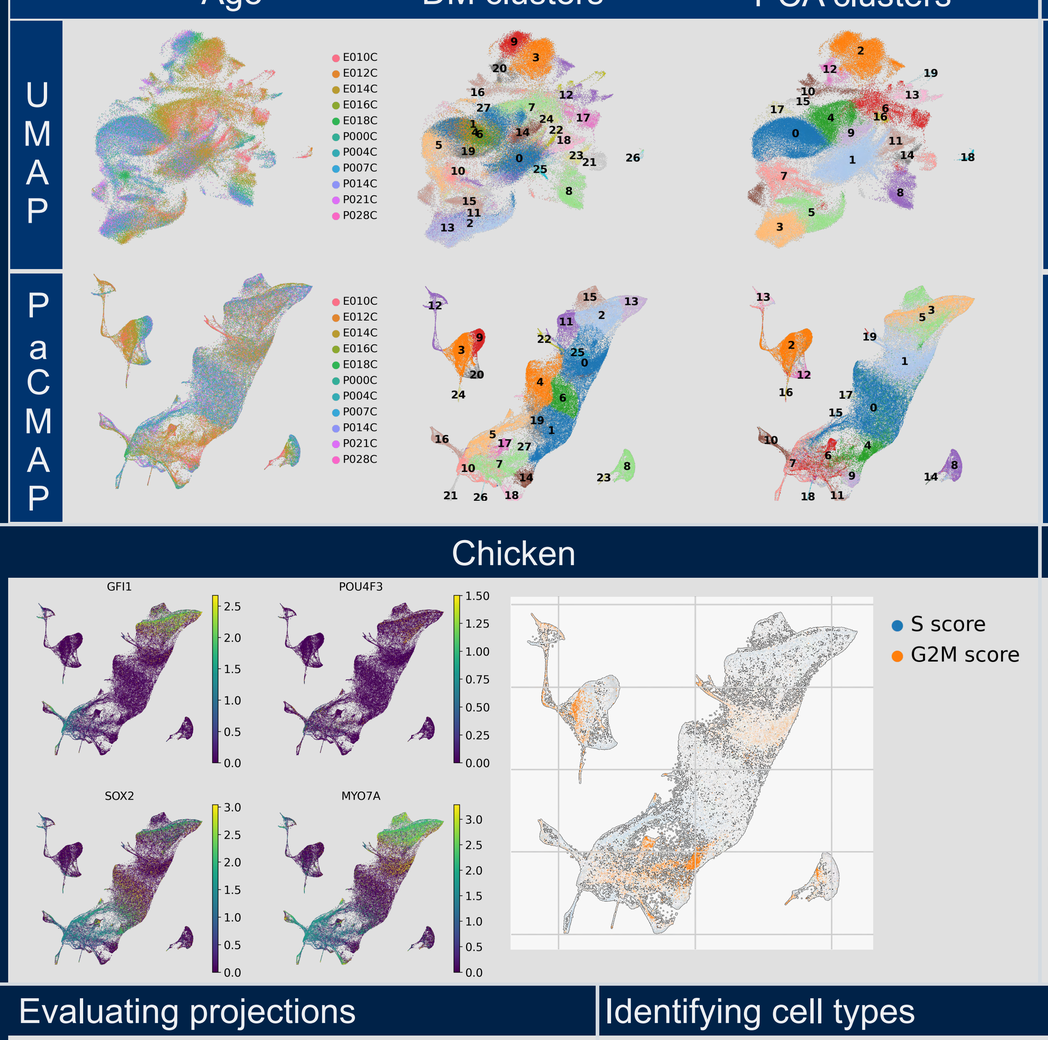
Dim. Estimation → Dim. Reduction → 2-D Projection and Leiden Clustering

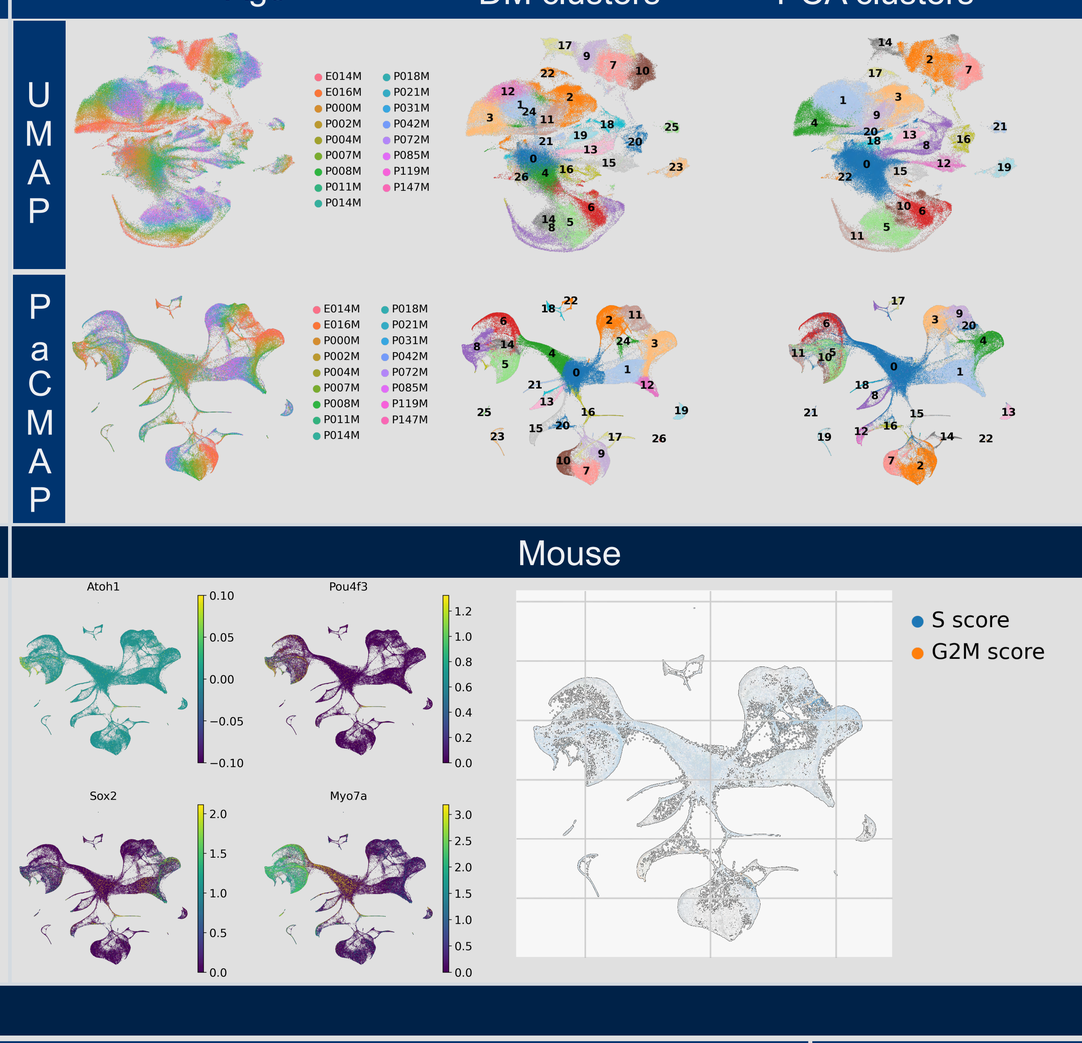
Spectrum decay	Diffusion maps	MAP or PaCMAP	DM based
		No assumption of uniformity Other projections available	Resolution=0.5





Comparing clustering in chick & mouse datasets

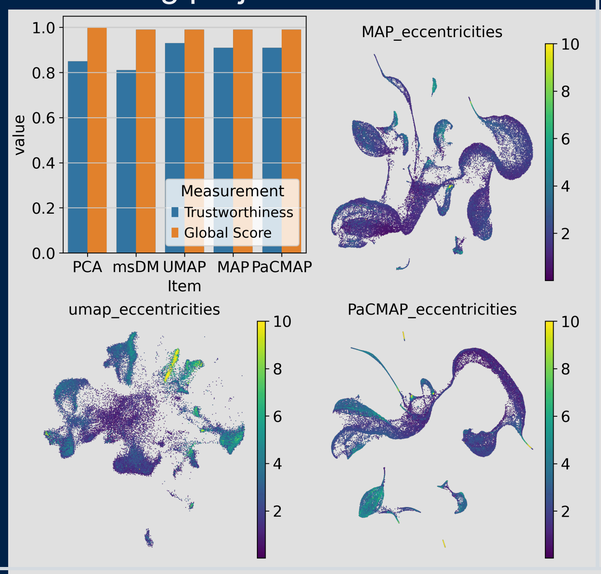




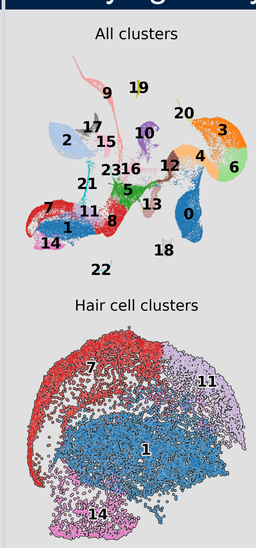
Cell cycle & differentiation

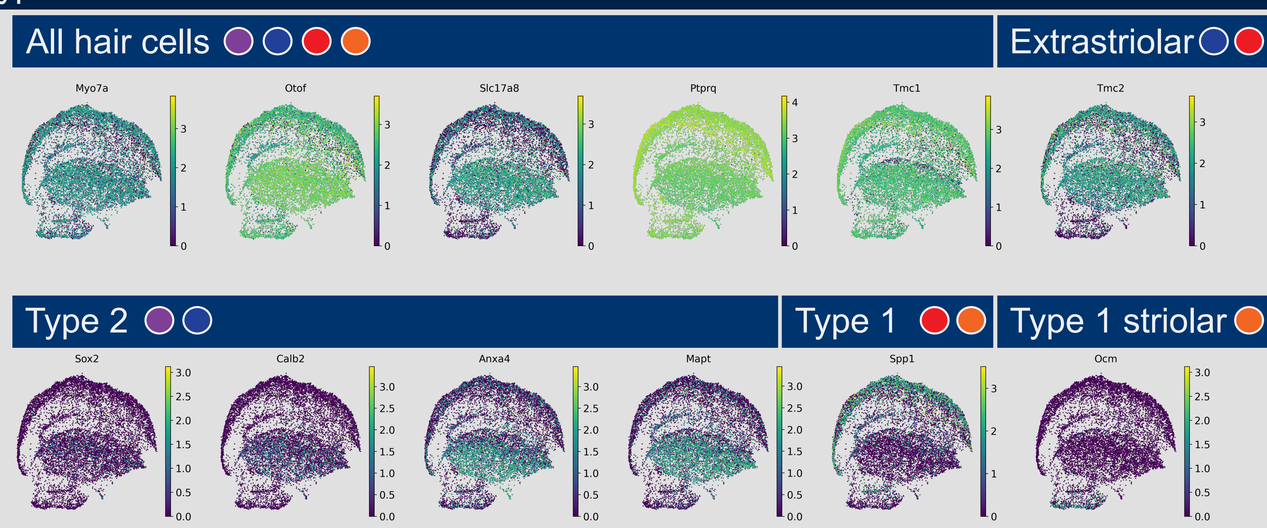
Defining mouse postnatal cell types

Evaluating projections



Identifying cell types





References

Sidarta-Oliveira, D. & Velloso, L.A. (2022) 'TopOMetry systematically learns and evaluates the latent dimensions of single-cell atlases', *bioRxiv.*

Ask me anything! ☺
Use the QR code to see this poster on GitHub.

Lipovsek, M. (2024) 'Comparative biology of the amniote vestibular utricle', *Hearing Research*.

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