

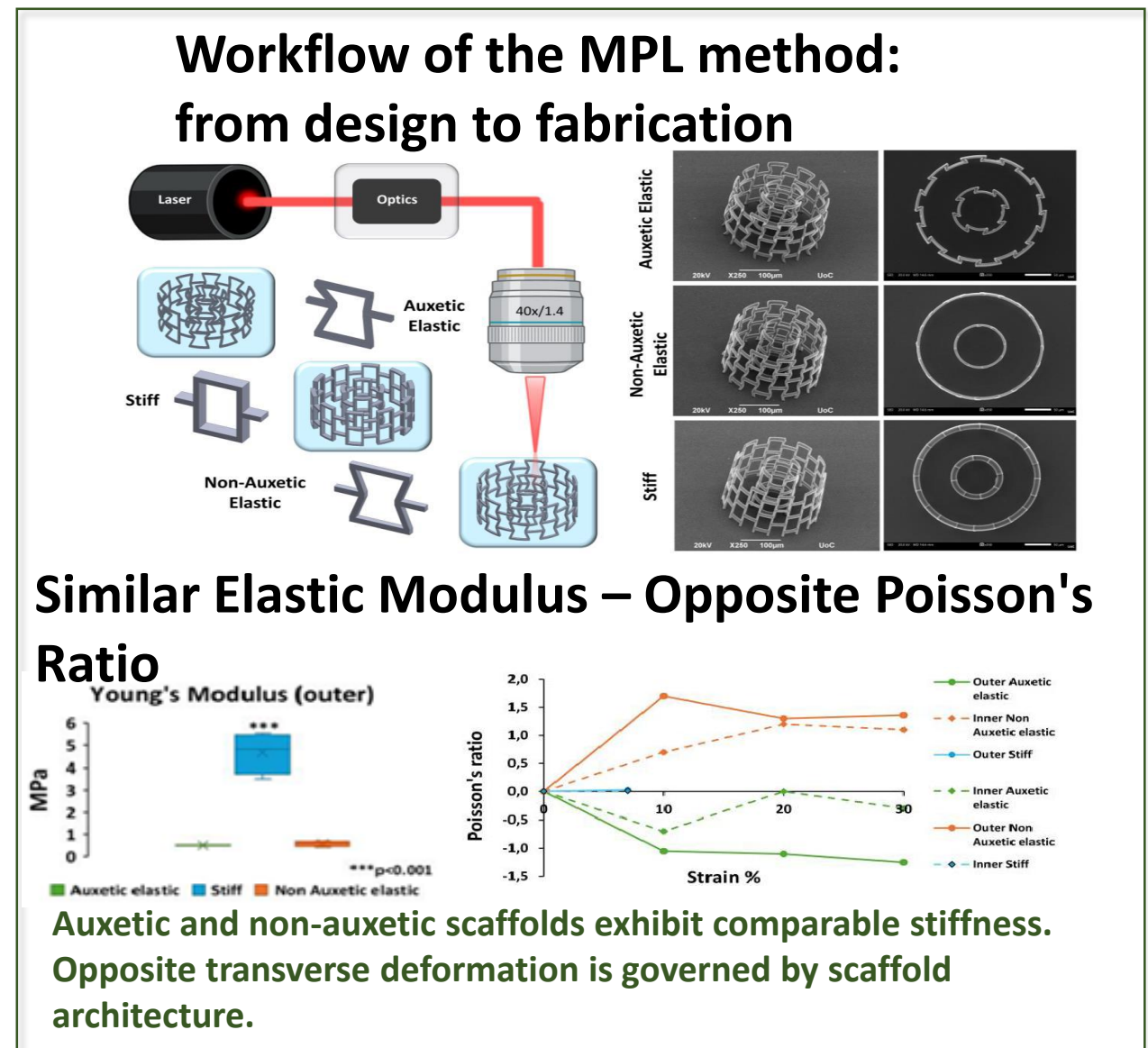
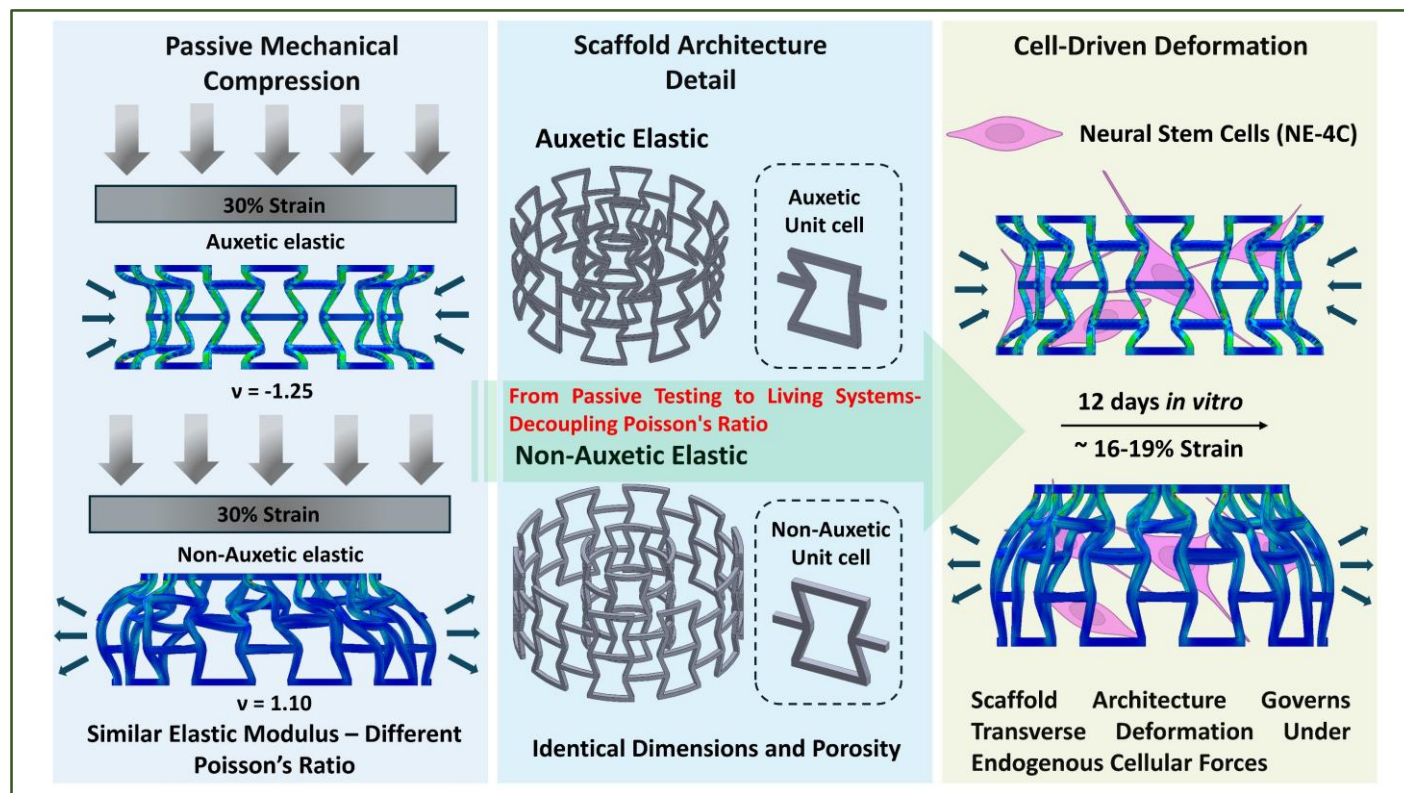
Mechanotransduction-driven neural differentiation on elastic and auxetic 4D microenvironments fabricated via multiphoton lithography



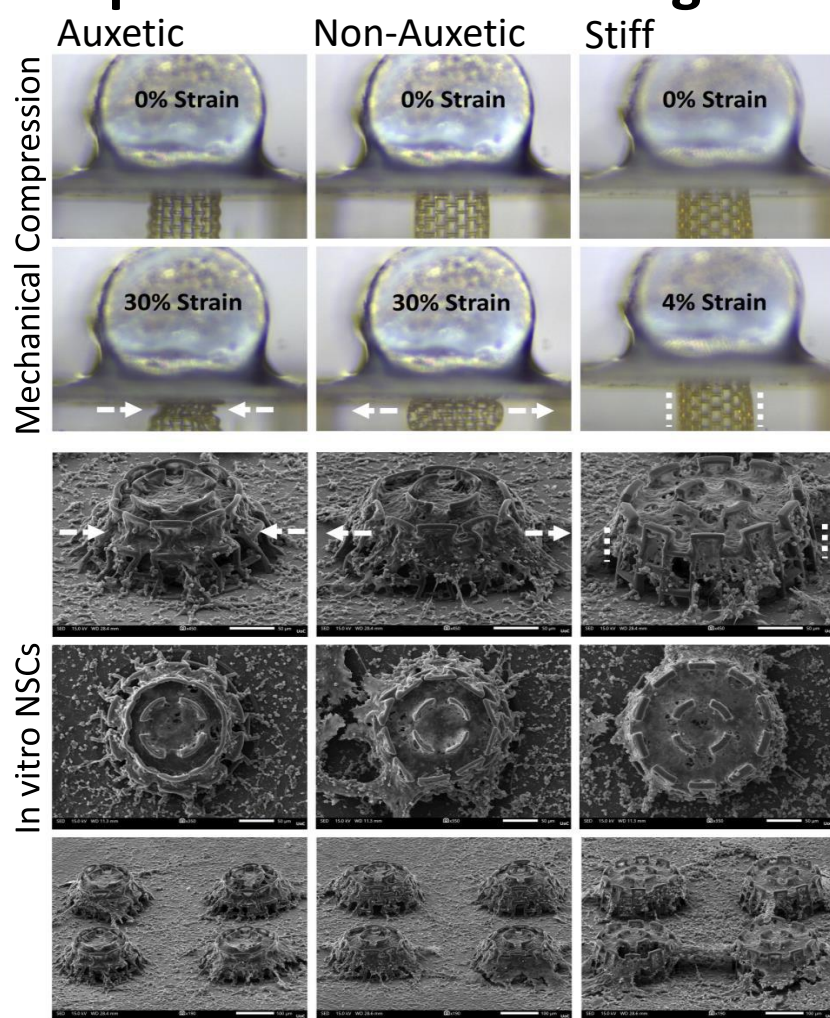
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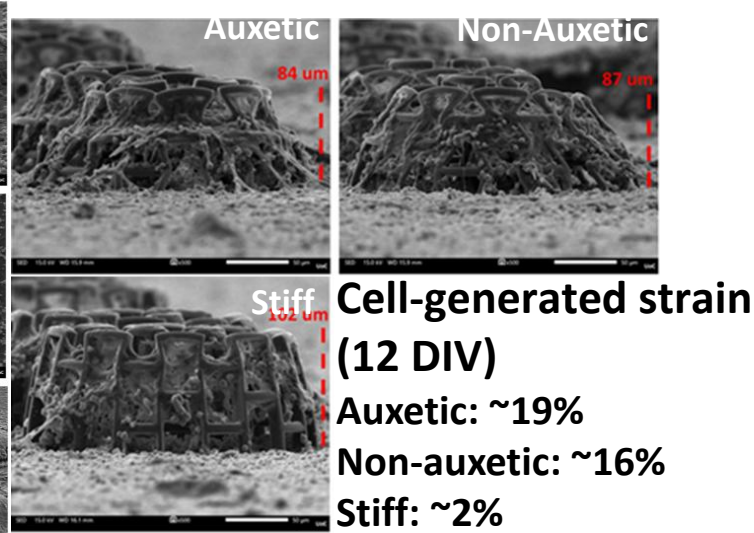
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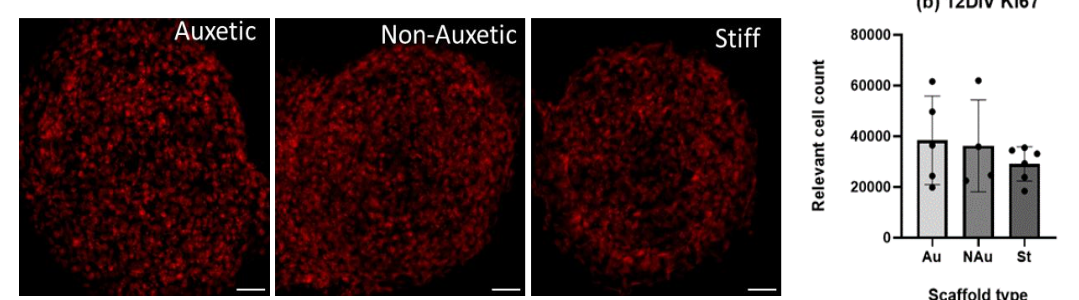
Architecture-defined deformation modes are preserved under cell-generated forces.



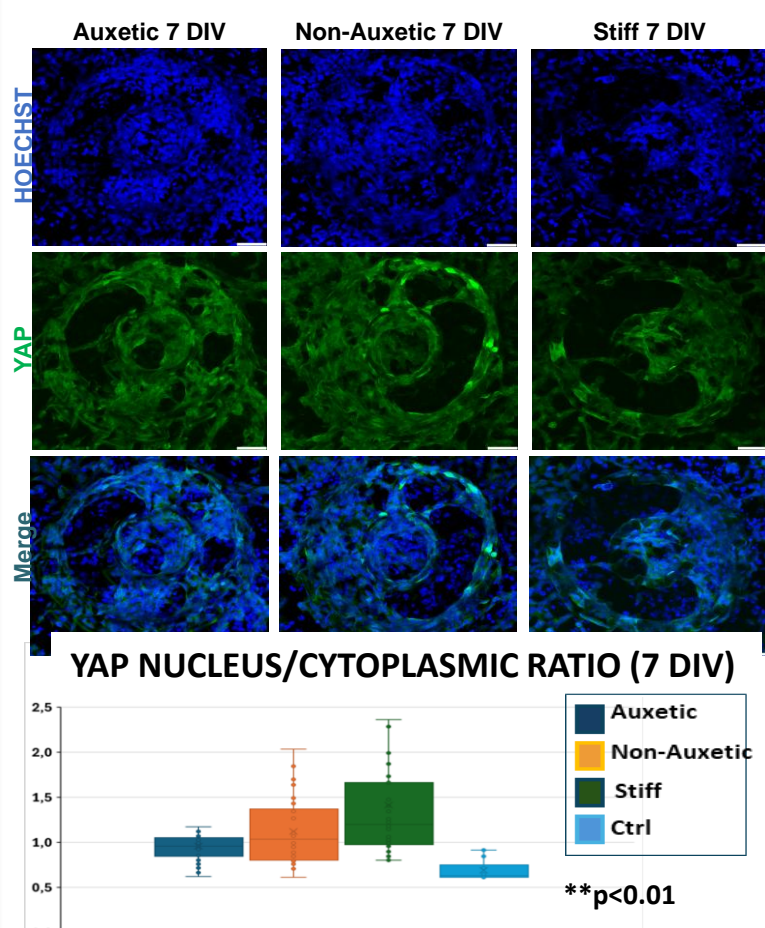
- **Auxetic: inward radial contraction.**
- **Non-auxetic: outward transverse expansion.**
- **Stiff: minimal cell-driven deformation.**



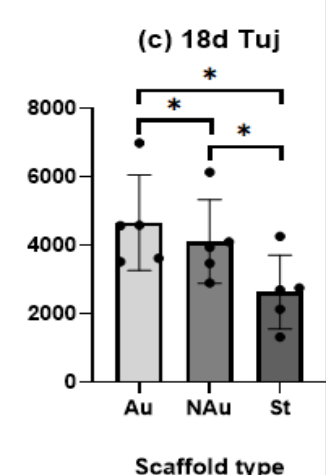
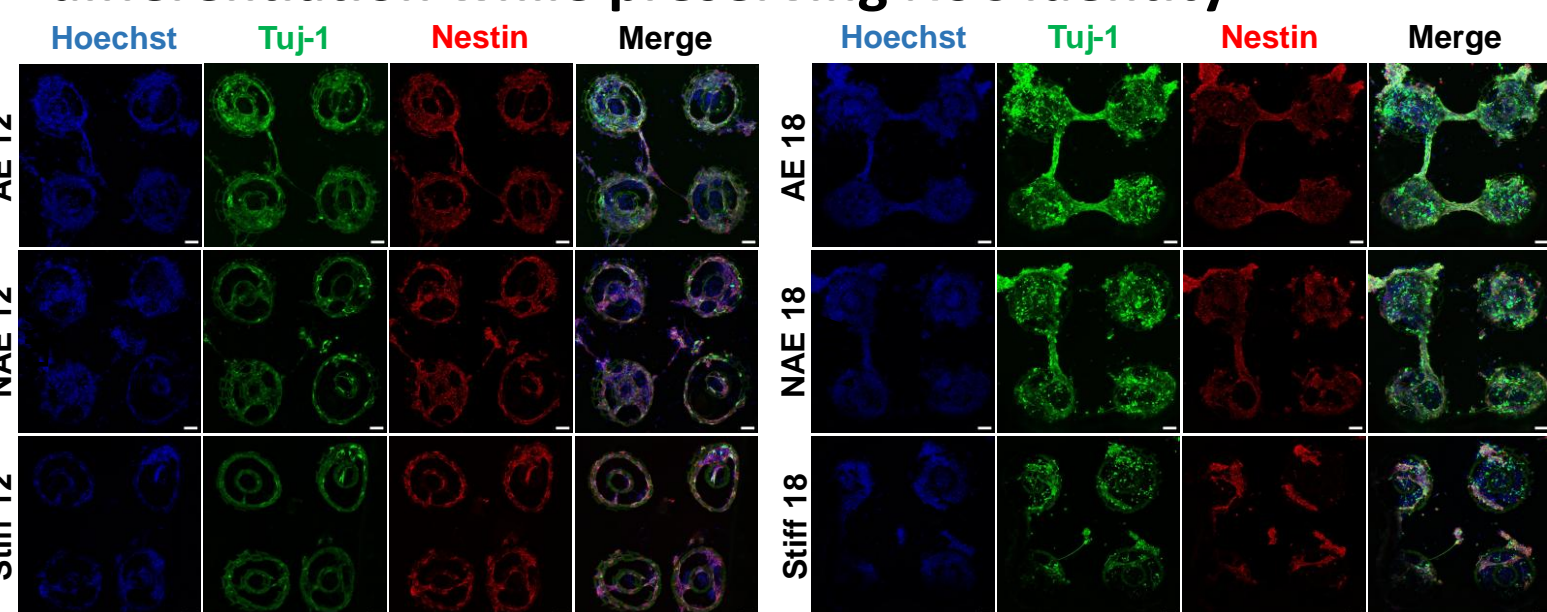
Comparable NSC proliferation across scaffold architectures



Architecture-dependent YAP localisation



Auxetic microenvironments enhance spontaneous neuronal differentiation while preserving NSC identity



Architecture-dependent YAP localisation correlates with enhanced neuronal commitment in auxetic microenvironments.

CONCLUSIONS

- ✓ Scaffold architecture governs deformation behaviour under both passive and cell-generated loading.
- ✓ Elasticity regulates NSC fate, while auxeticity provides an additional mechanobiological advantage.
- ✓ Auxetic 4D microenvironments enhance neuronal commitment while preserving NSC/progenitor characteristics.
- ✓ Quantitative analysis confirmed architecture-dependent YAP localisation, supporting a role for mechanotransduction in NSC fate regulation.

MPL-fabricated auxetic microarchitectures represent promising platforms for neural tissue engineering and regenerative medicine.