# Investigation of protein gelation mechanism for the development of edible scaffolds

Master Thesis

**Motivation**

Producing enough food for a growing world population while reducing environmental damage is a huge challenge. The cultivation of meat has excellent potential to significantly reduce the use of energy, water, and land. Currently, only the production of thin layers of cultivated meat is possible, which limits the offering to minced or processed meat. To cultivate more desirable and natural whole-cut meat, the development of novel 3D cell scaffolds is essential. Sallea's (Spin-off ETH Zürich) indirect additive manufacturing technology enables the manufacturing of such scaffolds, addressing the limitations of current systems by providing open, hierarchical porosity and free choice of material to enable significantly enhanced nutrient transport during the cultivation of meat.

**Project Aim**

The aim of the master thesis is to investigate the gelation of plant-based proteins in a dissolvable template. Plant-based proteins are a preferable scaffold material due to their high protein content. However, the structuring thereof needs to be tuned carefully in order to obtain an appropriate texture.
The preparation of the scaffolds will take place at sallea (ETH Hönggerberg), where the focus will be on assessing the method and parameters needed to gel plant-based proteins into scaffolds with elastic, meat-like textures. Furthermore, supervision and expertise on food texturisation are provided by Prof. Patrick Rühs. Potentially, the scaffolds may be tested by an external partner for their ability to support cell growth and muscle tissue formation.

The tasks may change due to changes in the project progression and/ or because of the student's varying interests. Ideas, Interests, etc. from the student are highly appreciated.

**Methods you will learn/use**

Scaffold preparation

- 3D printing of sacrificial templates
- ev. CAD drawing
- vacuum infiltration, casting, injection moulding (depends on material)

Analysis methods:

- optical and electron microscopy
- mechanical testing/ texture analysis
- more upon desire/ course of the project

Additionally, you will have the opportunity to be part of a fantastic team and experience the vibe of an ETH Spin-off firsthand.

**Contact**

Do not hesitate to contact us for more details or questions about the project. We are happy to chat!

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**Literature**

Kleger, N., Fehlmann, S., Lee, S. S., Dénéréaz, C., Cihova, M., Paunović, N., Bao, Y., Leroux, J.-C., Ferguson, S. J., Masania, K., Studart, A. R., Light-Based Printing of Leachable Salt Molds for Facile Shaping of Complex Structures. Adv. Mater. 2022, 34, 2203878.