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## **BIO-INSPIRED SPRING-LOADED BIOPSY HARVESTER**

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**Background** – Current minimally invasive laparoscopic tissue harvesting techniques for pathology purposes involve taking multiple imprecise and inaccurate biopsies, usually using a laparoscopic forceps or other assistive devices. The potential hazards, i.e. cancer spread when dealing with tumorous tissue, call for a more reliable alternative in the form of a single laparoscopic instrument capable of repeatedly taking a precise biopsy at a desired location.

**Aim** – Design a disposable laparoscopic instrument tip, incorporating a centrally positioned glass fibre for tissue diagnostics, a cutting device for fast, accurate and reliable biopsy of a precisely defined volume and a container suitable for sample storage.

**Description** – Inspired by the sea urchin's chewing organ, the Aristotle's lantern, we designed a crown-shaped collapsible cutter enabling rapid and simultaneous tissue incision and enclosure. Based on a series of in-vitro experiments indicating that tissue deformation decreases with increasing penetration speed leading to a more precise biopsy, we decided on the cutter's forward propulsion via a spring. Apart from the embedded spring-loaded cutter, the biopsy harvester comprises a smart mechanism for cutter preloading, locking and triggering, as well as a sample container.

**Results** – A real-sized prototype suited for evaluation in a universal tensile testing machine was developed at TU Delft. The preloading, locking and triggering mechanism proved to work successfully. In-vitro evaluation will be carried out on animal tissues with respect to the cutter's incising and collapsing capabilities. Further division of the tip into a permanent and removable segment will enable taking of multiple biopsies mutually separated in individual containers. We believe the envisioned opto-mechanical biopsy tip will be a solution ameliorating time demanding, inaccurate and potentially unsafe biopsy procedures.

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