

Beam Me Up



“Beam me up, Scotty!” This became reality in science fiction movies as early as the 1970s. Whenever the crew of the Enterprise needed to get out of a difficult situation at the other end of the galaxy, a brief command from Captain Kirk was all that was needed to make his crew disappear in a glittering nothing and show up again at a faraway place almost instantaneously.

This fantastic imagination has now become reality for a small, inconspicuous worm: *C. elegans*, a nematode only 1 mm long, which normally remains hidden underground, has now followed the Enterprise crew. The technology called *Laser Microdissection and Pressure Catapulting* (LMPC) enables a single, multicellular organism to be “beamed” out of its environment, against gravity and in a non-contact manner, thus opening up entirely new possibilities, e.g. for the isolation of living cells.

Non-contact isolation

Intact organisms can be isolated in an entirely non-contact manner without affecting their vitality. This procedure marks the breakthrough in modern, laser-based isolation techniques and provides entirely contamination-free, pure and homogeneous specimens. The production of morphologically exactly defined base material, e.g. tissue samples from medical, biotechnological, cancer research or pharmaceutical research, are one of the most demanding tasks in genomic and proteomic research.

Transfer process

The lasers – a pulsed UV laser for cutting and a continuously emitting infrared laser for optical trapping – can be coupled to a microscope and concentrated on a minute focal spot thanks to an objective with a high numerical aperture. Special lens and mirror mounts ensure that the laser light runs parallel to the optical axis of the light microscope and that the laser focus remains in its predefined position: precise laser micromanipulation with highest possible accuracy of less than 1 μm is achieved.

The energy transfer is sufficient for exact fragmenting without any contact with the specimen. Since this process runs very quickly without any heat transfer, adjacent biological material or biomolecules such as DNA, RNA or proteins outside the focus are not affected. After the cutting process, the selected area is isolated from the object surface through a single laser pulse. The specimen can be “beamed” several millimeters away, against gravity, and transported directly into a vessel.

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