Purifying Nucleic Acids From Samples of Extremely Low Biomass

NASA's Jet Propulsion Laboratory, Pasadena, California

A new method is able to circumvent the bias to which one commercial DNA extraction method falls prey with regard to the lysing of certain types of microbial cells, resulting in a truncated spectrum of microbial diversity. By prefacing the protocol with glass-bead-beating agitation (mechanically lysing a much more encompassing array of cell types and spores), the resulting microbial diversity detection is greatly enhanced.

In preliminary studies, a commercially available automated DNA extraction method is effective at delivering total DNA yield, but only the non-hardy members of the bacterial bisque were represented in clone libraries, suggesting that this method was ineffective at lysing the hardier cell types. To circumvent such a bias in cells, yet another extraction method was devised. In this technique, samples are first subjected to a stringent bead-beating step, and then are processed via standard protocols. Prior to being loaded into extraction vials, samples are placed in microcentrifuge bead tubes containing 50 µL of commercially produced lysis solution. After inverting several times, tubes are agitated at maximum speed for two minutes. Following agitation, tubes are centrifuged at 10,000× g for one minute. At this time, the aqueous volumes are removed from the bead tubes and are loaded into extraction vials to be further processed via extraction regime.

The new method couples two independent methodologies in such as way as to yield the highest concentration of PCR-amplifiable DNA with consistent and reproducible results and with the most accurate and encompassing report of species richness.

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Adjustable-Viewing-Angle Endoscopic Tool for Skull Base and Brain Surgery

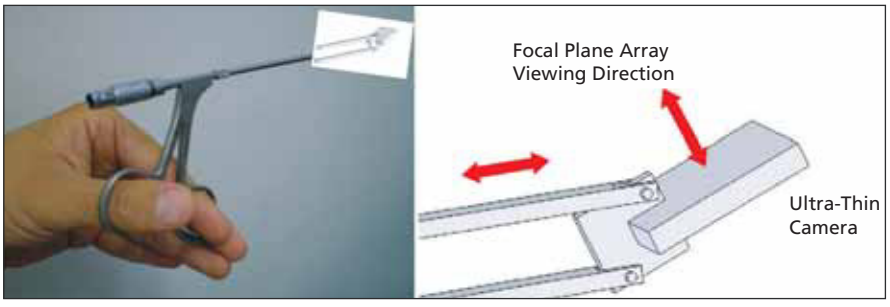
Surgeons could operate more precisely.

NASA's Jet Propulsion Laboratory, Pasadena, California

The term "Multi-Angle and Rear Viewing Endoscopic tooL" (MARVEL) denotes an auxiliary endoscope, now undergoing development, that a surgeon would use in conjunction with a conventional endoscope to obtain additional perspective. The role of the MARVEL in endoscopic brain surgery would be similar to the role of a mouth mirror in dentistry. Such a tool is potentially useful for *in-situ* planetary geology applications for the close-up imaging of unexposed rock surfaces in cracks or those not in the direct line of sight.

A conventional endoscope provides mostly a frontal view — that is, a view along its longitudinal axis and, hence, along a straight line extending from an opening through which it is inserted. The MARVEL could be inserted through the same opening as that of the conventional endoscope, but could be adjusted to provide a view from almost any desired angle. The MARVEL camera image would be displayed, on the same monitor as that of the conventional endoscopic image, as an inset within the conventional endoscopic image. For example, while viewing a tumor from the front in the conventional endoscopic image, the surgeon could simultaneously view the tumor from the side or the rear in the MARVEL image, and could thereby gain additional visual cues that would aid in precise three-dimensional positioning of surgical tools to excise the tumor. Indeed, a side or rear view through the MARVEL could be essential in a case in which the object of surgical interest was not visible from the front.

The conceptual design of the MARVEL exploits the surgeon's familiarity with endoscopic surgical tools. The MARVEL would include a miniature electronic camera and miniature radio



The **MARVEL** would include part of the mechanism of an endo-scissor. The scissor linkage would be modified for use in adjusting the camera angle instead of actuating a scissor blade.