

transmitter mounted on the tip of a surgical tool derived from an endo-scissor (see figure). The inclusion of the radio transmitter would eliminate the need for wires, which could interfere with manipulation of this and other surgical tools. The handgrip of the tool would be connected to a linkage similar to that of an endo-scissor, but the linkage would be configured to enable adjustment of the camera angle instead of actuation of a scissor blade.

It is envisioned that thicknesses of the tool shaft and the camera would be less than 4 mm, so that the camera-tipped tool could be swiftly inserted and with-

drawn through a dime-size opening. Electronic cameras having dimensions of the order of millimeters are already commercially available, but their designs are not optimized for use in endoscopic brain surgery. The variety of potential endoscopic, thoracoscopic, and laparoscopic applications can be expected to increase as further development of electronic cameras yields further miniaturization and improvements in imaging performance.

*This work was done by Youngsam Bae, Anna Liao, and Harish Manohara of Caltech and Hrayr Shahinian from Skull Base Institute for NASA's Jet Propulsion Labora-*

*tory. Further information is contained in a TSP (see page 1).*

*In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:*

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## UV-Resistant Non-Spore-Forming Bacteria From Spacecraft-Assembly Facilities

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Four species of non-spore-forming bacteria collected from clean-room surfaces in spacecraft-assembly facilities could survive doses of ultraviolet (UV) radiation that would suffice to kill most known cultivable bacterial species. In a previous study, high UV resistance was found in spores of the SAFR-032 strain of *Bacillus pumilus*, as reported in "Ultraviolet-Resistant Bacterial Spores," *NASA Tech Briefs*, Vol. 31, No. 9 (September 2007), page 94. These studies are parts of a continuing effort to understand the

survival of hardy species of bacteria under harsh conditions, and develop means of sterilizing spacecraft to prevent biocontamination of Mars that could in turn interfere with future life detection missions.

The four species investigated were *Arthrobacter* sp. KSC\_Ak2i, *Microbacterium schleiferi* LMA\_AkK1, *Brevundimonas diminuta* KSC\_Ak3a, and *Sphingomonas trueperi* JSC\_Ak7-3. In the study, cells of these species were mixed into Atacama Desert soil (to elucidate the shadowing

effect of soil particles) and the resulting mixtures were tested both in solution and in a desiccated state under simulated Martian atmospheric and UV conditions. The UV-survival indices of *Arthrobacter* sp. and *Microbacterium schleiferi* were found to be comparable to those of *Bacillus pumilus* spores.

*This work was done by Kasthuri Venkateswaran and Shariff Osman of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov. NPO-45739*