SMART PROBE

The NASA Smart Probe, which actually "learns"
from experience, originated at
a 1992 meeting convened
"to discuss the common challenges between
neurosurgery and soil analysis."

Researchers realized that both fields were seeking
"improved accuracy for probe placement,"
and that both would benefit from a probe
that not only extracted target matter
but also could convey information.

Equipped with an array of multimodal
sensors, the surgical Smart Probe registers
environmental features such as pH,
partial oxygen pressure, tissue stiffness,
electrical activity and blood flow.

The heart of the probe is a 6000-pixels
fiber optic camera. The chemical
composition of the tissue can be read
in the reflected light; the different
waveforms correspond to different tissue types.

"Originally trained on tofu
because of its similar consistency
to brain tissue, the Smart Probe is ready
to change its 'diet.'" Animal trials
are measuring the sensor signatures

in fat, muscle, kidney, spleen and various
regions of the brain. It has even begun
amassing data on abnormal
tissue by examining human
mammary tumors grown on the backs of rats.

The neural net is "taught" to interpret
weighted sensor data, relating readings
to a population or within
an individual. The moment the thin
needle-sized instrument is inserted,

it starts to assemble a model
of what is normal. When the confidence
level around the sensor values is
exceeded, it generates a "malignant"
output in a fraction of a second.

"This space-age technology won't remain
earthbound." The Smart Probe is scheduled to function
"as part of a 'robotic astrosurgeon'"
attending the crew aboard a two-year
Mars mission planned for 2020.

Dr. Russell Andrews of NASA Ames
Research Center explains: "It may sound
like Star Trek, but much of the technology
is already here.... You could be in Maine
and perform an operation in Iceland."

If symptoms appeared during the mission,
a Probe could be introduced into the brain,
and the software would compare real-time values
with archived parameters from pre-launch scans.
"The surgeon, perhaps on Earth, could issue

high-level commands," and it could execute
the procedure, if needed. We no longer
have to depend on inexact tactile feedback;
"This apparatus permits finer control
than is possible with the human hand."

Robust, reliable, lightweight, compact,
Smart Probes will serve multiple purposes.
During the long flight, they will assist
in research, monitoring, for example,
the effects of weightlessness. And after

touchdown, scores of Probes will be dispersed
across the surface, to analyze tiny
samples of planetary terrain
for useful minerals, or, conceivably,
even evidence of organic life.

— Melissa Monroe

Melissa Monroe is a poet who teaches at the New School for Social Research in New York. "Smart Probe" is one of a series of poems she has written about medical instruments. She is the author of *Machine Language*, and a new book, *On Trepanation and Human Nature*, is forthcoming.

Editor's note: "Smart Probe" contains intralinear breaks or pauses, known as caesuras. Their use dates in English language poetry to Old English and Beowulf (8th to 11th century); they function to separate metrical units or contrasting ideas or to provoke thought.