

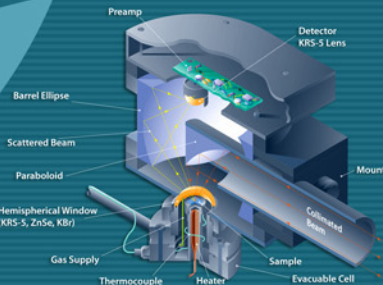
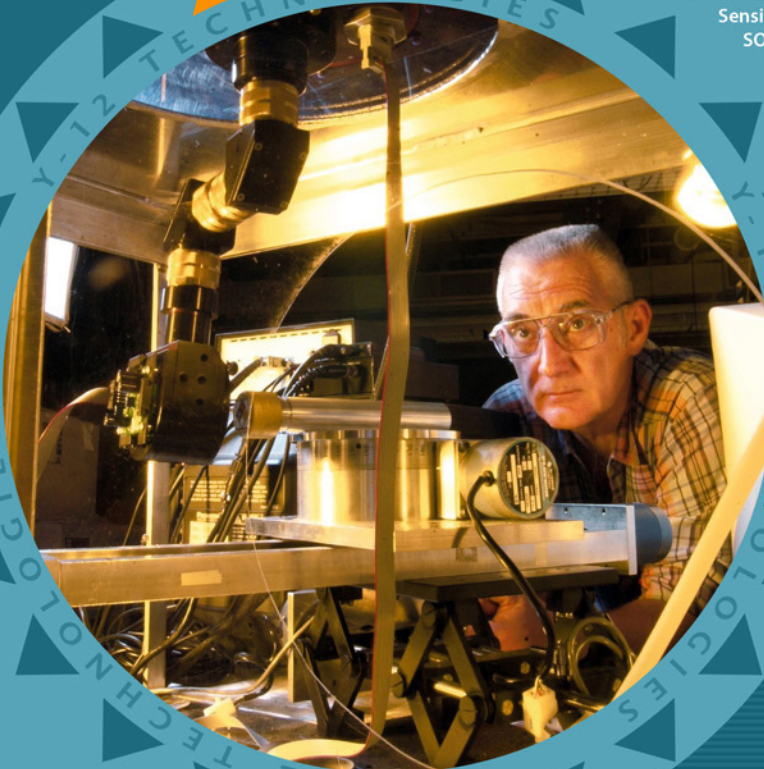
# Development and Future of Infrared Surface Analysis Through Partnering

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Y-12 has partnered with private industry and government agencies to develop an array of tools, generally based on Fourier transform infrared (FTIR) spectroscopy, to benefit infrared surface and gas analysis. These tools evolved from the Harrick Scientific Evacuatable Cell and Spectropus Remote Sensing Accessories and from the Surface Optics SOC 400 Surface Inspection Machine and FTIR High Speed Imaging System.

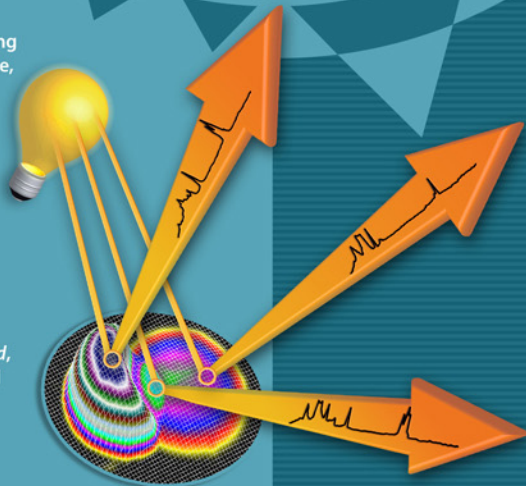
Several two- to four-way partnerships among users, sponsors, and manufacturers have led to products integrated into the gas burette and surface analysis laboratory at Y-12 and elsewhere.

Y-12 has developed applications based on hyperspectral imaging using spectra obtained by mechanically manipulating samples for measuring each pixel and using similar spectra to monitor chemical reactions under controlled conditions to measure contamination and corrosion.



These partnerships have created commercial products while working toward solutions for the 6-D (space, time, directional, spectral) hyper-spectral imaging problem for extracting chemical information from the spectral dimension.

For example, bi-directional reflectance measurements and theory from Surface Optics have been implemented in movie animation by ESC Entertainment resulting in the realistic cloth appearance in *The Matrix Reloaded*, and thus, the 6-D modeling in real time is accomplished for color.



## FUTURE DIRECTION

- Y-12, Boeing, and Los Alamos National Laboratory are partnering with Surface Optics and Rockwell Science to research the use of FTIR cameras for surface analysis.
- Y-12, Surface Optics, Irvine Sensors, and Harrick Scientific are partnering to find the optimum optical conditions for remotely detecting chemical agents on the ground.
- Y-12 and Pantex are pursuing optimization of measurement and interpretation of spectroscopic data for process control and surveillance.



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