

Boris Muslin Seminar

Laser Techniques for Remote Chemistry, Mineralogy, and Organic Detection on Other Planets



Roger C. Wiens, Ph.D

PI for ChemCam Instrument,
Space Remote Sensing Group,
Los Alamos National Laboratory
and the University of New Mexico

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Abstract:

NASA's 1-ton Curiosity Mars rover has returned over half a million atomic emission spectra of material ablated remotely from rocks and soils along the rover traverse using the ChemCam instrument. An Indian lunar rover and a Chinese Mars rover are also adopting the laser-induced breakdown spectroscopy (LIBS) technique for planetary exploration. NASA's next rover, to launch in 2½ years, will include two laser Raman experiments. The SHERLOC instrument mounted on the rover's arm will use UV Raman spectroscopy to search for organic materials; the mast-mounted SuperCam will deploy remote Raman, LIBS, time-resolved luminescence spectroscopy, and visible and infrared reflectance spectroscopy to study chemistry and mineralogy. We are also developing a prototype Raman-LIBS instrument for the surface of Venus and a time-resolved laser-induced luminescence imager to search for organics on outer solar-system ocean worlds like Europa. I will describe these techniques and the hardware used for exploration.

Biography:

Dr. Wiens has worked as a scientist at Caltech, the University of California, and Los Alamos National Laboratory, and has made extended research visits to NASA's Johnson Space Center, Jet Propulsion Laboratory, the University of Bern, Switzerland, and Paul Sabatier University in Toulouse, France. He was responsible for three instruments for NASA's Genesis mission and he acted in the capacity of Flight Payload Lead in 2004. Since 2004 Dr. Wiens has been the leader of the ChemCam laser instrument on the Curiosity rover (<http://mars.jpl.nasa.gov/msl/>; <http://www.msl-chemcam.com>) which landed in 2012. He has directed the US and French team operating ChemCam and interpreting the data returned from Mars. Dr. Wiens has been involved in other NASA robotic missions as well, including Stardust, Mars Odyssey, Lunar Prospector, and Deep Space-One, which include missions to the Moon, Mars, and comets. In 2014 NASA selected the SuperCam instrument, a successor to ChemCam, being built for NASA's next Mars rover, due to launch in 2020. He is now leading this new instrument development. Dr. Wiens has been recognized by NASA and Los Alamos National Laboratory for his contributions to science, and in 2016 he was knighted by the government of France for his work in "forging strong ties between the French and American scientific communities" and for "inspiring many young, ambitious earthlings."