

The 3rd Harsh-Environment Mass Spectrometry Workshop
and
The 2nd NASA/JPL Miniature Vacuum Pumps Workshop

March 25-28, 2002
Pasadena, CA

Program

Mon, March 25	Travel Day
7:00 p.m.	Welcome Reception at Courtyard Old Pasadena
Tue, March 26	HEMS Workshop
8:00 a.m.	Registration and Continental Breakfast
8:30 a.m.	"Welcome and Introduction" <i>Patricia Beauchamp</i> (Center for In Situ Exploration and Sample Return, Jet Propulsion Laboratory)
Technical Session I: Space Environments	
Chair: Patricia Beauchamp, Jet Propulsion Laboratory	
8:45 a.m.	"Novel Mass Spectrometric Approaches to the In situ Chemical Analysis of Galactic and Cometary Dust Particles" <i>Jack Beauchamp</i> , Daniel E. Austin, Thomas J. Ahrens (California Institute of Technology)
9:45 a.m.	"Mass Spectrometers in Deep Space Missions" <i>Paul Mahaffy</i> , Hasso Niemann, Dan Harpold (NASA/Goddard Space Flight Center)
10:15 a.m.	"Quadrupole Ion Trap Mass Spectrometry for Space Shuttle Ground Support" <i>Andrew Ottens</i> , W. Harrison (University of Florida); Timothy Griffin (Dynacs Inc.); William Helms (NASA/ Kennedy Space Center)
10:45 a.m.	Break
11:00 a.m.	"Test of a Miniature Double-Focusing Mass Spectrometer for the Variable Specific Magnetoplasma Rocket (VASIMR) at the Advanced Space Propulsion Laboratory (ASPL)" <i>Jorge Diaz</i> (Universidad de Costa Rica); Franklin Chang-Diaz (Director, ASPL and Astronaut, NASA/Johnson Space Center); Jared P. Squire, Verlin Jacobson, Greg McCaskill, Andres E. Mora Vargas (ASPL- NASA/Johnson Space Center); Henry Rohrs, Rajiv Chhatwal (Mass Sensors, Inc.)
11:30 a.m.	"Regolith Evolved Gas Analyzer (REGA): An Instrument to Characterize the Martian Soil Mineralogy and Atmospheric Composition" <i>John H. Hoffman</i> (University of Texas at Dallas)
12:00 Noon	Informal Buffet Lunch

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Tues, March 26 HEMS Workshop (cont'd)

Technical Session II: Mass Spectrometers for Underwater Applications

Chair: R. Timothy Short, University of South Florida

- 1:30 p.m. **“The NEPTUNE Project: An Interactive Earth-Ocean Observatory at the Scale of a Tectonic Plate”**
John Delaney (School of Oceanography, University of Washington)
- 2:30 p.m. **“Underwater Mass Spectrometers: Some Critical Engineering Issues”**
Harold F. Hemond, Richard Camilli (Massachusetts Institute of Technology)
- 3:00 p.m. **“Underwater Mass Spectrometers for Detection of VOCs and Dissolved Gases”**
Gottfried Kibelka, Tim Short, David Fries (Center for Ocean Technology, University of South Florida)
- 3:30 p.m. **Break**
- 3:45 p.m. **“Mass SURFER Field Mass Spectrometer System for Deep Ocean and Planetary Lander Applications”**
Gary McMurtry [School of Ocean and Earth Science and Technology (SOEST), University of Hawaii, and Pacific Environmental Technologies], Steven J. Smith (Jet Propulsion Laboratory)
- 4:15 p.m. **“Multisensor Data Integration and Adaptive Sampling Strategies for an Autonomous Underwater Mass Spectrometer”**
Richard Camilli, Harold F. Hemond (Massachusetts Institute of Technology)

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4:45 p.m. Poster Session

"Airborne Deployment of the Aerosol Mass Spectrometer during the ACE-Asia Field Campaign"

Jose Jimenez, Roya Bahreini, Richard Flagan, John H. Seinfeld (California Institute of Technology); Hafliði Jonnson (Naval Postgraduate School); John Jayne, Douglas Worsnop (Aerodyne Research)

"Microfabrication of Cylindrical Ion Trap Mass Spectrometer Arrays"

Tim Short, David Fries, Gottfried P. G. Kibelka (Center for Ocean Technology, University of South Florida); Himani Peddanenikalva, Shekhar Bhansali (Dept. of Electrical Engineering, University of South Florida)

"Adaptation of a commercially available RGA for use onboard the ISS"

Norbert Mueller, Roman Sonderegger, Daniel Vogel (Inficon AG, Liechtenstein); Carlos Pereira (HTS AG, Switzerland)

"Miniaturized GC/MS Instrumentation: MEMS-based Gas Chromatography Coupled with Miniature Quadrupole Array and Paul Ion Trap Mass Spectrometers"

Paul M. Holland, Ara Chutjian, Murray Darrach, Otto Orient (Jet Propulsion Laboratory)

"Dual Source Time-of-Flight Mass Spectrometer and Sample Handling System"

William B. Brinckerhoff, Timothy J. Cornish (Johns Hopkins University/Applied Physics Laboratory); P. R. Mahaffy (NASA/Goddard Space Flight Center)

"Real Time Volcanic Gas Monitoring Station using "In-Situ" Mass Spectrometry at Irazu Volcano"

Jorge A. Diaz (Universidad de Costa Rica); W. Ronald Gentry, Clayton F. Giese (University of Minnesota); Eduardo Malavassi, Erick Fernandez, Eliecer Duarte [Observatorio Vulcanologico y Sismologico de Costa Rica (OVSICORI)]; Juan Valdez [Laboratorio de Quimica de la Atmosfera (LAQAT), Universidad Nacional]

"Ion Trap Secondary Ion Mass Spectrometry - Moving Toward Fieldable Systems"

Anthony D. Appelhans, J. E. Olson [Idaho National Engineering and Environmental Laboratory (INEEL)]

"The Improved Teeny-TOF Mass Spectrometer for Chemical and Biological Sensing"

Scott A. Ecelberger, Timothy J. Cornish, Wayne A. Bryden (Johns Hopkins University Applied Physics Laboratory)

"Multimembrane Inlet System for Mass Spectrometry Analysis"

Olga S. Viktorova, V. T. Kogan, A. K. Pavlov, Y. V. Chichagov (A. F. Ioffe Physical Technical Institute, St. Petersburg, Russia); B. M. Dubenskii, S. P. Parinov (AOZT "Analytic," St. Petersburg, Russia); A. G. Vitenberg (St. Petersburg State University, Russia); T. Kotiaho (Helsinki University, Finland); R. Ketola (VTT Chemical Technology, Helsinki, Finland)

"A High-Performance Handheld Gas Chromatograph"

Conrad M. Yu (Lawrence Livermore National Laboratory)

"Detection of 'Unknown Agents' in Harsh Environments using a Newly Developed Ruggedized Mass Spectrometer"

Kevin J. Hart, Irene F. Robbins, Marcus B. Wise, Wayne H. Griest, Stephen A. Lammert, and Cyril V. Thompson (Oak Ridge National Laboratory)

"A Rugged and Compact Time-of-Flight Mass Spectrometer for Fast and Sensitive Leak Detection"

Marc Gonin, Katrin Fuhrer, Michael Ugarov, Val Vaughn, Steve Ulrich, Michael McCully, Albert Schultz (Ionwerks, Inc.)

6:15 p.m. Evening Free

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Wed, March 27 HEMS Workshop (cont'd)

8:00 a.m. **Continental Breakfast / Vendor Expo**

Technical Session III: Earth Environments

Chair: Gottfried Kibelka, University of South Florida

9:30 a.m. **"Mapping and Monitoring Complex Chemical Components in Ambient Air using Fast GC/MS and Multivariate Data Analysis"**
Henk Meuzelaar, Neil S. Arnold (University of Utah)

10:30 a.m. **"Field-Portable, Fast GC/TOFMS"**
Jack Syage, Brian Nies, Rick Harkewicz (Syagen Technology, Inc.)

11:00 a.m. **Break**

11:15 a.m. **"Portable Double-Focus Mass Spectrograph with Multymembrane Inlet"**
Olga Viktorova, Viktor Kogan, Sergey Manninen (A. F. Ioffe Physical Technical Institute, St. Petersburg, Russia)

11:45 a.m. **"Addressing Forensic Field Analytical Chemistry Issues"**
Brian A. Eckenrode, Valerie Cavett (Forensic Science Research Unit, Federal Bureau of Investigation); Philip A. Smith, Gregory Kimm, Gary Hook (Uniformed Services University of the Health Sciences, Department of Preventive Medicine and Biometrics); Erin Sherry (The George Washington University, Department of Forensic Sciences)

12:15 p.m. **Informal Buffet Lunch**

Technical Session IV: Bio-applications

Chair: Mahadeva Sinha, Jet Propulsion Laboratory

1:30 p.m. **"Detection of Microorganisms with MS: Field-Portable Instrumentation and Innovative Methodology"**
Franco Basile, Angelo Madonna, Kent J. Voorhees [Colorado School of Mines (CSM)]; Stephen Lammert (Oak Ridge National Laboratory); Brian Musselman, Vladimir Doroshenko [Science & Engineering Services, Inc. (SESI)]

2:00 p.m. **"Design of a Novel Miniature MALDI-TOF Mass Spectrometer for High-Throughput Medical Screening"**
Ben Gardner, Robert English, Robert Cotter (Johns Hopkins University School of Medicine)

2:30 p.m. **"Fieldable MALDI-TOF Bioaerosol Analysis System"**
Wayne A. Bryden (Johns Hopkins University Applied Physics Laboratory)

3:00 p.m. **Break**

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Technical Session V: Novel Concepts/ Miniaturization

Chair: Paul Wennberg, California Institute of Technology

- 3:15 p.m. **“Miniature Mass Spectrometers and Front-end Interfaces”**
Ara Chutjian, Murray Darrach, Otto Orient (Jet Propulsion Laboratory/California Institute of Technology); Paul Holland (Thorleaf Research, Inc.)
- 4:15 p.m. **“Evaluation of Small Mass Spectrometer Systems as Candidates for the Development of Miniature Mass Spectrometer Systems”**
Richard Arkin, Timothy Griffin (Dynacs Inc.); Andrew Ottens (The University of Florida); Jorge Diaz (Universidad de Costa Rica); Duke Follestein, Fredrick Adams, William Helms (NASA/ Kennedy Space Center)
- 4:45 p.m. **“Miniature Cylindrical Ion Trap Mass Spectrometry”**
Jeremy Moxom, William Whitten, Peter Reilly, Michael Ramsey (Oak Ridge National Laboratory)
- 5:15 p.m. **“A LIGA Fabricated Two-Dimensional Quadrupole Array for High Resolution Mass Spectroscopy”**
Nosang V. Myung, Otto Orient, Kirill Shcheglov, Beverley Eyre, Dean Wiberg (Jet Propulsion Laboratory)
- 5:45 p.m. **“Concept for a Miniaturized Confocal Plane Mass Spectrometer using Micromachined Detector Array”**
Adi Scheidemann (Intelligent Ion, Inc.); Mahadeva Sinha (Jet Propulsion Laboratory); Bruce Darling (University of Washington)
- 6:15 p.m. **Free Time**
- 7:30 p.m. **Conference Dinner**, McCormick & Schmick's Seafood Restaurant, 111 N. Los Robles Avenue, Pasadena, CA
- Guest Speaker:** Brian Wilcox, Supervisor, Robotic Vehicles Group, Jet Propulsion Laboratory
- Topic:** “Surface, Subsurface, and Atmospheric Exploration of Planets and Small Bodies by Robotic Vehicles over the Next Two Decades”

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8:00 a.m. **Continental Breakfast**

8:30 a.m. **"Welcome and Introduction"**
Dean Wiberg (Jet Propulsion Laboratory)

Technical Session I: Miniaturization/Technical Issues

Chair: Dean Wiberg, Jet Propulsion Laboratory

8:45 a.m. **"The Technical Issues Associated with Highly Miniaturized Vacuum Systems"**
Phil Muntz (University of Southern California)

9:45 a.m. **"Meso-Scale Scroll Pump Array Fabricated using LIGA Technology for Portable, High-resolution Mass Spectrometer"**
Beverley Eyre, Kirill Shcheglov, Otto Orient, Nosang V. Myung, Dean Wiberg (Jet Propulsion Laboratory)

10:15 a.m. **Break**

10:30 a.m. **"Performance Analysis for Meso-Scale Scroll Pumps"**
Eric Moore, E. Phillip Muntz (University of Southern California); Francis Eyre, Nosang Myung, Otto Orient, Kirill Shcheglov, Dean Wiberg (Jet Propulsion Laboratory)

11:00 a.m. **"The Knudsen Compressor as an Energy Efficient Micro-Scale Vacuum Pump"**
Marcus Young, E. P. Muntz, G. Shiflett (University of Southern California); A. Green (Jet Propulsion Laboratory)

11:30 a.m. **"MEMS-Based Low-Flow Meters"**
Tom Tsao, Fukang Jiang, Edward Chiu (Umachines, Inc.)

12:00 Noon **Informal Lunch Buffet**

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Technical Session II: Commercialization Issues

Chair: Merrilee Fellows, Jet Propulsion Laboratory

- 1:30 p.m. **“The Issues Limiting Large-scale Commercialization of Miniature Vacuum Systems”**
Peter Kardok (Alcatel Vacuum Products, Inc.)
- 2:30 p.m. **“Development of Turbomolecular Pumps for Demanding Environments”**
Marc Kenton (Creare, Inc.)
- 3:00 p.m. **“Miniature Turbo-molecular Pump”**
Rob Rowan, Mark Johnson (Phoenix Analysis & Design Technologies)
- 3:30 p.m. **Break**
- 3:45 p.m. **“KSC Miniature, Rugged Mass Spectrometer Applications and Development Progress”**
Frederick Adams, Duke Follistein (NASA/Kennedy Space Center);
Richard Arkin, Tim Griffin (Dynacs, Kennedy Space Center)
- 4:15 p.m. **“Miniature Peristaltic Vacuum Pump with Magnetic Actuation”**
Sabrina Feldman, Danielle Svehla (Jet Propulsion Laboratory)
- 4:45 p.m. **“Development of a Miniature Lightweight Ion Pump”**
Mahadeva P. Sinha (Jet Propulsion Laboratory)
- 5:15 p.m. **Closing Remarks**
Patricia Beauchamp (Center for In Situ Exploration and Sample Return,
Jet Propulsion Laboratory)
- 5:30 p.m. **Adjourn**