A ‘New Mars’
Revealed by 21st Century Exploration Technology

David Des Marais, PhD
Moffett Field—February 22, 2013

Mars is the one other planet in the solar system that apparently had a climate most similar to that of Earth. Mars differentiated very early into a core, mantle and crust; it preserved an ancient geological record that has no parallel on Earth; and it evolved mostly if not completely without plate tectonics. An early hydrological cycle sustained precipitation, streams and lakes. Later, volcanism, impacts, groundwater and ice interacted at least locally. Liquid water participated in rock weathering reactions, such as iron and sulfur oxidation, that created distinctive weathering regimes. Conditions might have supported life sometime in the past and perhaps might sustain it even today.

NASA’s recent rover missions have deployed “robotic field geologists” that are exploring promising landing sites where ancient environments might have sustained life. But roving on Mars encounters severe challenges, both technical and scientific. The orbits of Earth and Mars constrain launches to three-week time windows that occur only once every 25 months. Entry, descent and landing in the thin Martian atmosphere (7 millibars) is far more challenging than on Earth or the Moon. The large Earth-Mars distances make real-time control of spacecraft impractical so they must function autonomously. The rovers are assaulted by dust, terrain hazards, and daily temperature excursions that can exceed 150 degrees Fahrenheit. Data transmission rates are throttled by the substantial power required to communicate between the rovers and Earth. And no human error is forgiven; a single mistake can end the mission.

These challenges, among others, have been met successfully by 20 years of rover design and more than nine years of experience on Mars. This lecture will summarize the daily routine whereby the science and engineering teams interact with the rovers – uplinking commands and then receiving and responding to the downlinked reports of rover status and scientific observations. Advances in the art of rover exploration have been hard-won by learning how to survive in the Martian environment, surviving human errors and other crises, inventing new tricks, and learning from discoveries. And, of course, all of this has been achieved remotely with no possibility of repairing any hardware malfunctions. These considerable efforts have led to a scientific bonanza that has expanded our understanding of Mars enormously. The Mars Exploration Rover (MER) Opportunity revealed that water once flowed to the surface across the vast Meridiani plains, creating saline lakes whose waters were roiled by ancient winds that also sculptured their salt deposits into sand dunes. Opportunity then drove more than 30 km to explore even older deposits on a crater rim. MER Spirit found evidence that thermal waters (heated by volcanism or by impacts?) altered rocks to create sulfate salts, siliceous sinters and, possibly, habitable environments. Curiosity rover has already found stream gravels as well as sediments that might have been deposited in a Gale Crater lake. Observations by orbital cameras and spectrometers have characterized other localities that are different in some ways but might also have witnessed habitable environments in the distant past.

Dr. David Des Marais is a senior space scientist at NASA Ames Research Center. He has investigated the geochemistry of lunar samples, meteorites and both volcanic and ancient sedimentary rocks from Earth. He coordinated a long-term study of benthic cyanobacterial microbial ecosystems. David is Principal Investigator of the Ames Research Center Team of the NASA Astrobiology Institute. He is currently a member of the science teams of NASA’s 2003 Mars Exploration Rover mission, the 2005 Mars Reconnaissance Orbiter mission, the 2011 Mars Science Laboratory mission and the 2016 ExoMars/Trace Gas Orbiter mission. He has published more than 160 technical articles and chapters on these topics. David is Chair of NASA’s Mars Exploration Program Analysis Group. He is a Fellow of the Geochemical Society, the European Association of Geochemistry, the International Society for the Study of the Origins of Life, the California Academy of Sciences, the American Geophysical Union, and the American Academy of Microbiology. In 2012 the Geochemical Society awarded him the Alfred Treibs Medal for career achievement in organic geochemistry.
The Marine Archaeological Forum was held at the Maritime Museum on Friday afternoon. Chaired by Explorer Medalist Dr. Lee Talbot and broadcast worldwide, courtesy of Rick Elkus of the San Diego Chapter, the two-hour session heard from all who registered to speak by the January 23 deadline. Each of the presentations were in response to the ‘talking paper’ prepared by the panel, available on the TEC Member’s website.

- The prohibition of TEC support for the commercial sale of marine artifacts was not challenged.
- There were presentations that sought ways to reduce plundering made ever more easy by the availability of modern technology.
- An approach for a ‘Third Way’ to fund expeditions was provided.
- A system of artifact registry was presented.
- An impassioned plea to find a way to protect and explore maritime wrecks was given by Ms. Tamalia Alisjahbana of Indonesia’s Team of Heritage Experts.
- All present agreed the forum represented all sides of the issue and was a successful means to review a topic that is of critical importance to the Club and explorers worldwide.

As to the questioned flag that initiated the call for a forum, Member Sandizell stated he has redrawn any effort to request a flag and is appreciative of the Club’s response to the very real problem of responsibly protecting maritime sites.

- The commission will make their report to the Board, after receiving all comments, in the Spring.

What a night! The gods must have been very happy with us as the evening of the slightly rolling shipboard dinner and story-telling night could not have been more perfect weather—clear, beautiful and sparkling. We went for celestial effects, starting with a near-full moon as it made a jaw-dropping appearance over San Francisco Bay. With perfect timing, it rose above the Bay Bridge just as guests were arriving for Friday night’s dinner aboard the Santa Rosa, a 1927-vintage retired ferryboat that plied the bay in the early 1930s. The bridge itself added a festive mood as the new dancing LEDs were being displayed all evening as the city and dock-side lights shimmered off the water. San Francisco Bay and The City were showing off—with pride and grandeur—in honor of our Explorers Club President, Alan Nichols, the officers and visiting Board of Directors, Chapter Chairs and explorers from around the country.

Best of all, this was “Story Night”, with a stellar menu of speakers and stories that enthralled, amazed and delighted. Typical of explorers tales, they ranged from the seas to the mountains:

- Captain Norman Baker’s told of the loss of his beloved square-rig Anna Christina as she sank in an Atlantic hurricane—and the heroic Coast Guard helicopter rescue of all aboard, at night during that raging ‘perfect’ storm that took her.
- Brian Hanson spoke of a voyage to South Georgia, where with a slight misstep he shattered his pelvis and broke his hip—and of a surprise shipboard hospital-bed visit, as he was being transported to safety, from fellow explorer Neil Armstrong.
- Catherine Nixon-Cooke delighted all with her memory of an incredible moment with a Silverback Gorilla.
- Mark Fowler showed bits of his latest film telling of the once-hushed story of the extent of German submarine incursions into our waters during WWII and their toll of torpedoed merchant ships.
- Lee Langan outlined his quest to find the Home of the Gods high on Mount Olympus, in hopes of possibly proving its existence. Pictures included a one-year-old Damien Marken—from the audience he introduced now Dr. Marken, a Ph.D. archaeologist, who he urged to become a member.

In the audience as well was Bob Atwater, another Director—kept from the stage by a debilitating cold; he will come back to tell a story from the Sahara!

Other attending Explorers Club luminaries, besides our president, were three Explorers Medalists: Honorary President Dr. Don Walsh, Dr. Lee Talbot and Dr. Don Johanson. It was quite a night—one to be remembered with a smile and a special joy knowing we can meet, talk to and be in the company of fellow explorers.

Chairman Anders Jepsen ended the evening with a toast to the Northern California Chapter itself, for February 18th marks our fortieth year!

—Von Hurson, MN’11

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From the Chair— Well, what a weekend that was! Talk about a team effort for our monthly meeting: starting with Lee Langan convincing some of the Club’s Directors, in town for a Board Meeting, to give us a 10-minute talk; Rick Saber working through finding the Hornblower’s Santa Rosa as a suitable venue, arranging the catering, and the various details that go into such an event; Joan Boothie juggling the registration, the money and the name tags; Jim Hurson sorting out the audio visuals and the speakers; Mike Diggles sending out extra email blasts to assure a good crowd; Kay Schmieder coordinating the speakers and preparing the framed speaker certificates; all the volunteers who pitched in; and finally, a great evening with lots of fun and interesting stories. There were 112 attendees. Wow!

The Member Moment was a great success too, with Don Dana showing off his Amazonian Blow Gun, darts and curare from Ecuador, and Club V P Julie Chase pipping up that she had one just like that at home in New York City. How many people do you know who have a 9-foot blow gun lying around the house? While Norm Baker’s story about his sailing ship and his wife was very moving, my favorite was Catherine Nixon-Cooke’s story about the gorilla and her gaudy socks. If you missed it, ask for details.

The Sunday morning events, which included either a bike ride from San Francisco to Belvedere or a walk to Lands End and the Palace of the Legion of Honor, finished with a final lunch all together in Tiburon. These were great chances for local members to meet the Directors of our beloved Explorers Club and to get to know them better. And we did, with lots of participation from local Chapter members as well as member guests from clubs as far away as Washington DC, the Pacific Northwest, Portland, San Diego and Los Angeles.

Which leads me to what comes next: a trip to NASA. At our meeting on Friday, February 22, we will have a chance to tour the NASA space museum at Moffett Field in Sunnyvale and to hear a presentation on the latest data from the Mars Curiosity expedition by one of the senior NASA scientists on the project. Please register soon, since the meeting is less than three weeks away. If you know of any students that might be interested, please encourage them to attend at the reduced student rate. Or, invite them as your guest!

Note that our Chair Emeriti Lee Langan & Alan Nichols are running for the 2013 Board Election. I heartily urge you to support both and to pass the word!  

Dues go to the cost of our newsletter! Send $25 to Joan Boothie

From the Board The Northern California Chapter can take pride in the hospitality they lavished upon those Directors and Officers that came to our fair city—which could not have had better weather. It was only three packed days, but a great deal was accomplished under ideal conditions. Friday began with the long-anticipated Forum established to advise The Explorers Club on the impact of commercialism upon maritime archaeology; it was well attended and ‘broadcast’ by telephone throughout the world. That evening a good crowd enjoyed listening to tales that had an impact upon five members of our Board—and another from our own Don Dana. Early Saturday visitors took a ferry to Tiburon—how better to arrive for a meeting. Business was addressed in the facilities of the Corinthian Yacht Club provided by Vice Chair Rick Saber; most notably all who had asked to be placed on the ballot for the next ‘class’ of directors were accepted. (Yes, I am running and seek your vote!) On Sunday Chapter members and the Board alike biked or hiked in the inviting environment of the San Francisco Bay Area.

The list is building as we begin a new year. Add your name!

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Member Moment— Sir! Please check your weapons at the gangway before boarding our Ship!… For January’s Member Moment, Don Dana MN’06 brought the 9-foot blowgun of Huaorani hunter Moi, who was made famous by Joe Kane’s 1995 book on the Ecuadorian Amazon called Savages. The blowgun arrived with a quiver of curare-tipped poison darts and a piranha jaw used to notch the darts to make sure that the poisoned tip remains embedded in the flesh even if the prey manages to rub off the shaft. Don was prepared to demonstrate techniques that could be used in an attempt to resuscitate a victim of curare poisoning. Our wide-eyed audience produced no volunteers.
February 22, 2013 – NASA’s roving geologists on Mars

**February 22, 2013**

Date: Friday, February 22, 2013
Place: NASA Ames Exploration Center
NASA Parkway, Outside the Gate
Mountain View, CA

**Time:**
5:00 - visit the exhibits
6:30 - reception, host wine
7:15 - dinner — 8:00 - talks

**Cost:**
$55, students $39
(2013 dues due: $25!)

**Please mail information to Joan Boothe,**
2435 Divisadero St., San Francisco, CA 94115
or email hoo dooskr@aol.com or call (415) 346-5934

**Please reserve no later than February 18!**

**Use PayPal!**
For those of you who have an account, you can transfer money to: explorersnorca@gmail.com

There is a PAYPAL BUTTON on our website (www.explorersnorca.org); easy to use!

**February Meal Options (select your choice)**
Chicken / Vegetarian

The NASA Ames Complex is at Moffett Field, Mountain View, CA. The NASA Exploration Center is a large white vinyl tent outside the secured-area Main Gate. Get to Highway 101: go south from San Francisco, north from San Jose to the large open airfield with those dirigible hangers in sight in Mountain View. Take the Moffett Boulevard/NASA Parkway exit to the bay side of the highway. The center is just there, with plenty of parking.

Come anytime after 5 pm, and tour the NASA exhibits