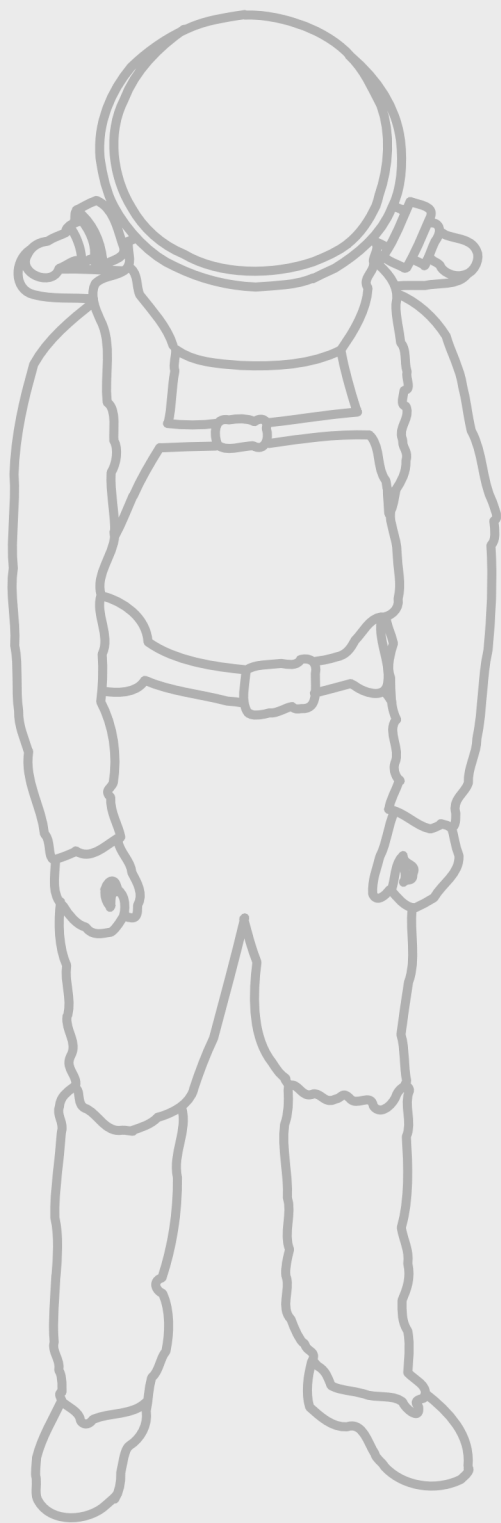




Heading to Mars

Field Journal, Crew 119
Mars Desert Research Station
Dec 1 - 14 2013

Crew Journalist Dan Wilcox

Onward to Mars!

Tomorrow's Realm

*in some far-off place
many light years in space
I wait for you
where human feet have never trod
where human eyes have never seen
I'll build a world of abstract dreams
and wait for you
in tomorrow's realm
we'll take up the helm
of a new ship
like the lash of a whip
we'll start on the way
and safely journey
to a new shore*

Sun Ra

Mission Report, Crew of the Phoenix One

Landing successful at 13:42 MST.

Final systems check underway for initial EVA on the Red Planet. Ready to make a second "small step" and begin exploration of a familiar new world.

Thanks to Anika, John, Paula, Lisa, Habib, The Mars Society, the MDRS team, Lowry, Golan, Bob, the CMU School of Art, the CMU College of Fine Arts, Diane, and many more. See you on the Red Planet.

Abstract

NASA and commercial space companies will send humans to Mars by the 2030s on what may be a one way trip. Would you go?

Artist Dan Wilcox spent 2 weeks on a simulated Mars mission in the Utah desert wearing a spacesuit, living a tin-can existence, and experiencing the hardship and excitement of extra-planetary exploration as research for concept album and astronaut rock opera *robotcowboy: Onward to Mars*, premiering May 10th 2013:

In 2030, scientists discovered the fundamental frequency of the universe and that all living things are attuned to the specific harmonics of the celestial bodies they call home. Humans, accustomed to Earth's frequencies, must know the music of another planet upon reaching a new world, otherwise face cellular collapse as dissonant vibrations collide. With the first manned mission to Mars already on its way, a crash course astronaut musician is sent on a one way trip to reach the Red Planet first and learn the "song of Mars" before he literally shakes apart. The fate of humanity's future in space rests on his shoulders ...

Terms

ATV

: 4-wheeled All Terrain Vehicle

Cryptobiotic crust

: microbial soil colony

EVA

: Extra Vehicular Activity aka “going outside in a space suit”

EVA suit

: Space Suit for Extra Vehicular Activities

Hab

: the Habitat, our 9 m diameter tin-can home on Mars

MDRS

: acronym for the Mars Desert Research Station

Mission Support

: our support and remote science team back on Earth

MPS

: the Mars Positioning System

MST

: Mars standard time

Sol

: a Martian Day, 24 hours 40 mins

Overview

Mars Desert Research Station (MDRS)



Analog Mars mission simulation run by the Mars Society and located in the high desert near Hanksville, UT

Teams of hard working volunteers, working in full simulation mode in the barren canyonlands of Utah continue to explore the surrounding terrain, cataloging more waypoints, and analyzing the geology and biology of this fascinating and remarkably Mars-like region.

- The Mars Society, mdrs.marsociety.org

The Mars Society



The purpose of the Mars Society is to further the exploration and settlement of the Red Planet.

We will accomplish this through:

- *Public outreach fostering Mars pioneers*
- *Worldwide support for government-funded Mars research and exploration*
- *Private-enterprise Mars exploration and settlement*

Starting small, with hitchhiker payloads on government-funded missions, we intend to use the credibility such activities engenders to mobilize larger resources, further enabling private robotic missions and ultimately human exploration and settlement of Mars.

- The Mars Society, marsociety.org/home/about/purpose

Crew 119



In October 2012, I applied and was accepted to be part of Crew 119, the first crew rotation in season 12, Dec 1-14 2012.

We were a crew of 5 and had specific roles to match our backgrounds:

Commander John Reynolds

Retired airline pilot from the UK

Executive Officer/Health Safety Officer Paula Crock

Physicist & satellite data analyst with Antarctic research experience from the US

Engineer Habib Palenfo

Mechanical engineer / pilot in training from the Ivory Coast

Scientist Lisa Stewart

Sociologist / psychologist from Australia

Journalist Dan Wilcox

Artist / engineer / musician from the US

The analog simulation is set up to replicate a real Mars mission. The location is desolate and very Mars-like with no vegetation in the red clay area around our Habitat, itself designed along the Zubrin/Baker [Mars Direct](#) mission plan. We wore EVA suits while outside, de-/re-compressed in the airlocks, monitored our resource usage, and cooked with dehydrated food. All communication was with/through Mission Support via a satellite link and email, which was purposefully cumbersome in order to simulate some aspect of the 20 minute radio propagation delay between Mars and Earth. There is a greenhouse, observatory, and ATVs for Mars rover EVAs.

As we were the first crew in the season, there were no footprints or tracks left over from the last crew, so our rotation was a "first landing" simulation. We approached our 2 weeks as the first crew on Mars and began with a blank slate as pioneers, exploring and mapping the area.

Journalist Role

As Crew Journalist, I wrote a daily report in the "first landing" perspective and compiled pictures to send to Mission Support.

Our crew reports were published on the [MDRS Mission Reports](#) page and the Mars Society Facebook page. My images were published to the [MDRS Flickr account](#) and some are now used on the MDRS & Mars Society webpages.

I also sent one tweet each sol (Martian day) with a picture from [@danomatika](#).

Training



First Photo of Earth from Mars, Mars Reconnaissance Orbiter 2003

Mars Compared to Earth

- 1/2 the size
- 1/10 atmosphere
- 1/3 gravity
- 44% sunlight
- 40 min longer day
- ~2x longer year
- 4 seasons
- a Martian day is called a *sol*

Physical Training

Conducted Nov 2012 in the red clay soil of Huntsville, AL my hometown and home of Wernher von Braun, NASA Marshall Spaceflight Center, and Space Camp.



Movement and agility exercises on simulated Martian soil

Before traveling across space, astronauts must train for the rigors of a hostile new world.



Feeling what it's like to stand on another planet

Astronauts must also prepare for momentous, symbolic actions.

Mission Goals

Crew 119: Laying the Groundwork

As the first crew on Mars, our mission is to

- Explore & map the surrounding area
- Identify sites for detailed investigation by future crews
- Shakedown systems and procedures
- Integrate data collection

As the vanguard for human exploration of the Red Planet, Crew 119 places an emphasis on exploration and applied science. Robotic satellite mapping from orbit has provided us with high level reconnaissance, but now it's our turn to scout on the ground, turning over rocks along the way. Our aim is to map the area and find sites for future detailed study, test existing systems, pioneer new ones.

Every step we take at Mars Base One paves the way for countless crews.

Commander John Reynolds

Commander Reynolds will lead his crew of scientists, engineers, and over-all adventurers. He'll keep them safe, motivated, and an effective working group while acting as a liaison between Mars Base One and Earth Mission Control.

Astronomer / HSO Paula Crock

Paula will perform astronomical study using the Musk Observatory and act as the liaison between the crew and the Flight Surgeon.

Biologist / Geologist Lisa Stewart

Lisa's work as biologist/geologist at MDRS has four aims:

1. Human factors: conduct research which examines crew decision-making dynamics
2. Water source development: experiment with the use of Mars analog materials for the production of terra cotta water filters and delivery systems
3. Food source production: test yeast and bacterial cultures as a basis for Mars-based food production.
4. Site identification: exploration of flora and geology in the surrounding area in order to locate sites for advanced study by subsequent crews.

Engineer Habib Palenfo

Habib will maintain vital life support systems, pilot Max, our tele-operated rover, as a remote platform for investigation and videography, and extend/develop engineering data analysis to better monitor crew resource usage.

Journalist / Scout Dan Wilcox

Dan will document the activities of the crew to give those on Earth a “feet on the ground” perspective, coordinate the scouting, mapping, and identification of points of interest, and locate fine pigments for the creation of Martian watercolors. Martian culture begins now.

T-minus 2 Days / Nov 29



It's weird to prepare for going to Mars the day before going, like going on a hike.

Personal Notes

Will future Martian humans look forward to the next planet like we do to Mars? Or read about Earth?

T-minus 1 Day / Nov 30



View from our space vehicle during the 6 month journey to Mars.

Personal Notes

Finally reading Zubrin's The Case for Mars, I feel like I could give up everything I know and go, the things we worry about seem so trivial in comparison.

Perhaps living a pioneers life is truer to living then the comforts we have today

Still don't know what I'm doing yet, came too late to meet anyone, will do at breakfast.

Feeling tired, won't send out info to the School of Art until early morning.

Shit, forgot towel ... forgot most important lesson from the Hitchhiker's Guide.

Sol 1 / Dec 1



#MDRS Sol 1: Have suit, will travel. The music of Mars is decidedly Johnny Cash's "Walk the Line": thin, dry, & distant.

Journalist's Report

Date: Sol 1 / Dec 1 2012

Written by: Dan Wilcox

After a bumpy entry through the Martian atmosphere, landing was A OK. After an initial inspection of the Hab systems and re-orientation to operating procedures (thank you Engineering Team!), the crew is ready for an extended stay on the red planet.

Spirits are high as we surveyed the terrain and even managed a short 20m foray from the Hab via Max, our remote-operated rover.

Soon after, I was the eager guinea pig for a space suit ingress test and all systems check ok. I'm not so sure about how my ears stick out of the snoopy cap, but it's not there for fashion. Also, I'm currently fashioning an addition to the crew entertainment system that allows for the connection of personal audio machines.

Our first meal on Mars was a resounding success and we are all raring to begin our experiments and especially EVAs.

During our 6 month voyage, I was trying to decide on what Mars would sound like, as in what would a Martian song consist of? I think it's something thin and distant, say Johnny Cash's *Walk the Line*. We have walked the line between the Earth and Space, then crossed it today. Next, we walk the surface.



Our 9m diameter Habitat or "Hab"

Personal Notes

survey scenario: Washing your hands, drinking water that comes from a defective urine/sweat recycling system .. How would you react and how would you deal with it? What about the other crew members?

coming up with an overall mission plan for the 2 weeks: terrain surveys, astronomy, long distance meet ups, spit bread, pysch questions, some art perhaps

the Air is very dry (8%), I can feel my skin all around me.

I thought I forgot my bath kit at the hotel on Earth ... it would be soo stupid to forget that toothbrush on another planet.

Sol 2 / Dec 2



#MDRS Sol 2: Hi winds and low vis kept us in the Hab on suit prep. Hopefully, Mars is cleaning up for it's new guests.

Journalist's Report

Date: Sol 2 / Dec 2 2012

Written by: Dan Wilcox

The wind kicked up and conditions were too dangerous for our first steps on Mars. Visibility is low and it would be easy to lose one's bearings or simply be blown over.

Perhaps the planet is sending us a message: either telling us to leave or cleaning up for new guests. I imagine a giant dust buster in reverse.

Similarly, Earth Comms are garbled due to planetary and solar wind conditions. In lieu of our planned EVA, we spent the day checking vital systems and staging Suit Ingress practice and procedures. In spite of the weather and "yet another drill", crew morale is high and preparations are underway for exploration of our landing sight next Sol.

Personal Notes

talking to capcom over email, it's slow and awkward but so would a 40 min delay ...

I'm pushing for a long EVA, I mean one where I need to have a urine collection kit installed (which we have)

I'm comfortable in the suit, the helmet doesn't really bother me, we'll see how it is in the field

Sol 3 / Dec 3



#MDRS: Sol 3: Our first step on Mars leads to life: a sea of fossilized mollusk shells > a mere whiff of organics.

Journalist's Report

Date: Sol 3 / Dec 3 2012

Written by: Dan Wilcox

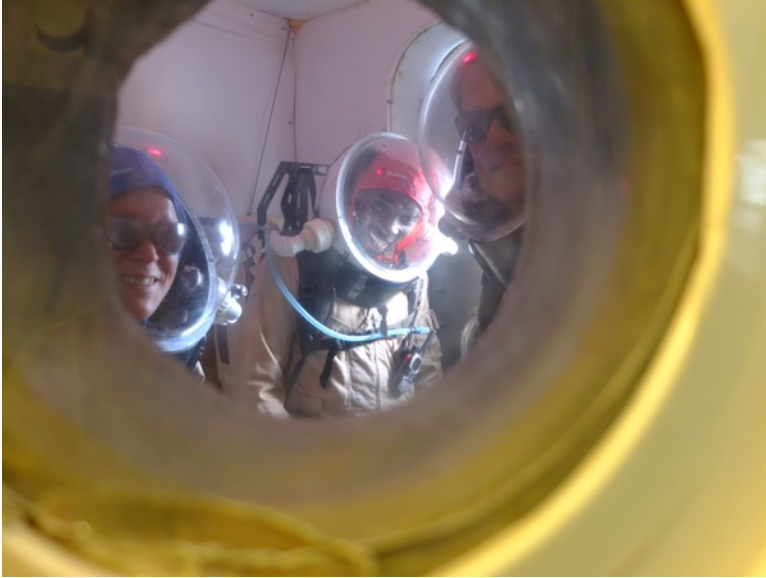
The winds from yesterday subsided and we finally stepped out on foot on Mars. We went in 2 crews, each lead by Commander Reynolds, as a short survey and suit familiarization and shakedown. The going was easy, but the suits take some getting used to. We all managed well, but several suits definitely need adjustment and slight repairs here and there.

Numerous geological formations were found and logged. In fact, we found conclusive evidence of ancient life in the form of fossilized mollusk shells and burrowing worm holes! Much more solid evidence than mere whiffs of organics ...

Sol 3 coincides with Dec 3, my birthday. As humanity is born onto the plains of Mars, so am I one earth year older ... roughly 15.5 Martian years. The crew made a feast of Chicken ala King, sweet potato chunks, and brownies with whipped cream. Delicious! Who said we'd have to squeeze meals out of a tube in space?

Backs are sore, but spirits are high. Very interesting to lose oneself in the background hum of the space suit oxygen generator, contemplating your own breathing. I definitely need to adjust the airflow to keep the visor from fogging.

Looking forward to our planned ATV EVAs tomorrow.



Paula, Habib, and Commander Reynolds during the 5 minute compression sequence.

Personal Notes

birthday on mars

todo: fix helmet fogging, radio PTT big button

ideas: record helmet breathing

there won't be fashion on mars, at least not for a while

a birthday on Mars ... Sol 3 on Dec 3!

Logging, lots of recording and marking ... this is a new world and even though it's already been mapped to hell by satellites in orbit, we have to range out on foot for a new perspective. A person on the ground can easily tell whether an area would be good for a road.

mapping and naming are key, there is power in setting names, even though large features have been named remotely, local ones will be named by those who get there first

trying to find the perfect EVA logging workflow ... need a stylus

*Control issues with Mission Support. We don't know what they want for each report and the miscommunication leads to further delays. *sigh* In many ways, we don't have true autonomy.*

Sol 4 / Dec 4



#MDRS Sol 4: No EVA today, using Marsat maps for planning next Sol. Observatory set up, time to peep Earth.

Journalist's Report

Date: Sol 4 / Dec 4 2012

Written by: Dan Wilcox

For every EVA, there are plans and reports, comprehensive work involved with making sure the time spent out on the Martian soil is utilized effectively and safely. When it takes 5 minutes to pressurize the Habitat's airlock, you can't just run back home when you've forgotten something and "be right back". One mistake can be catastrophic, so everything is checked and double checked.

But don't get me wrong, we don't sit in our tin can all day deliberating and monitoring. We've been training and practicing together the last 2 years before the 6 month voyage from the Earth to Mars. We know the maintenance, checklists, and procedures in our sleep. This is our life and we're prepared for it.

Today, using satellite maps from various robotic Martian orbiters, Paula and I identified several suitable beds for future roads. We've planned 2 EVAs for next Sol in order to both scout the terrain and possible road areas as well as identify sites for future exploration. Sometimes it's best to get your feet dirty and turn over a rock now and then. Armed with this data, we'll be better able to plan future EVAs.

As there were no planned EVAs today, things might seem slow, yet our tin can was bubbling with activity. There were systems to monitor, tomorrow's EVA to plan, rover upgrades, and the general administrative paperwork for the folks back in Mission Control. They, like all of planet Earth

want to know what we're up to and the 20 minute delay for radio transmission doesn't make it any easier.

As the first crew on Mars, we are scouts and explorers. There is power in mapping, in saying "here is something" and "this is this place". We've been logging our progress using MPS (Mars Positioning System) and I've been compiling a map of our exploration. With each EVA, our tracks extend ever outward from the Hab as the knowledge and experience of the human race expands with every step.



We added temporary mounts to the Norcal Max remote rover for a Go Pro and boom mounted camera to get a "rover's eye view" of the surrounding terrain.

Personal Notes

writing mission statement

rover: write script to convert rover gps log to GE kml, create portable station to take rover out into the field

planning to head out and identify both roads as well as points of interest for future investigation

ongoing maintenance required

EVA planning, crew rotation goals

EVA proposal shot by Mission Control, wasn't detailed enough and submitted late ... feels like grade school homework, guess we shouldn't head out like cowboys

Sol 5 / Dec 5



#MDRS Sol 5: 2 EVAs today, scouted roadbeds and interesting sites on ATVs, there is power in mapping our new world.

Journalist's Report

Date: Sol 5 / Dec 5 2012

Written by: Dan Wilcox

After all the planning on Sol 4, we went back out again into the Martian sun ... which happens to be the same sun that you have on Earth. We get the same light as you, it just takes a little longer to get here.

Our first EVA was a short foray to a feature to the South we are calling the Gateway as it is a natural pass between a series of long, tall hills forming a rough half circle about 2 km South of our home in the Habitat. We took our Martian ATV's out for the first time so getting there was no sweat.

We explored the local strata and checked out our radio range. As you can imagine, it's important to keep in contact with the place you get your air and power from ... it may be daylight on Mars but it sure is cold! Also, wearing a space suit is hard business, but when this is your business it's just another thing you do to go outside. Like everything, you get used to it.

Our second EVA took place during the afternoon and we covered more ground, roughly 10km. We scouted several areas that would make ideal roadbeds and identified 4-5 sites for future investigation. As the daylight waned, we had to return to the Hab without reaching our destination. Why? The temperature drop between light and shadow is extreme and you don't want to be caught out in the cold. It's important to limit our time outside and safely button up inside our tin can at night.

From what we've found today, we're updating our maps and planning 2 EVAs for tomorrow: a long range scouting mission to extend the mission from today and a close range geological investigation of several domed outcroppings half a kilo from the Hab.

By splitting the work, we more efficiently utilize the time. The adventurers head out mapping the area and find good spots to return to and the scientists check out these spots in detail. I expect this cycle to continue on Mars until there's nothing left to find, and by that time, people will be heading onward and outward.

Personal Notes

exploration, see long distances, suspension of disbelief

what does it feel like to be a Martian?

it's hard to hear in a plastic bubble

wearing a space suit is hard business, but when you're in our business it's just another thing you do to go outside, you get used to it

maybe first explorers won't be pure scientists ... the Apollo astronauts weren't

this is a lot of work, really

Sol 6 / Dec 6



#MDRS Sol 6: Roamed far and wide today but sometimes the best things are in your own backyard, even on Mars.

Journalist's Report

Date: Sol 6 / Dec 6 2012

Written by: Dan Wilcox

We went far and wide today.

During this morning's EVA Sol 6 A, Habib and I completed the roadbed survey. We now have an accurate map of a loop to the East of the Hab and located several locations for future road continuation.

Along the way we passed through plains of blown sand which could be a silica source for Martian glass and other products. As pioneers, we're always on the lookout for useful resources as it doesn't make sense to bring everything on the 6 month journey from Earth. It just wouldn't be possible, so we have to live off the land here.

That being said, we're still on the lookout for the supply drop from the first Earth Return Vehicle that contains our portable nuclear reactor. As it is, we have plenty of battery power from the 6 month trip here but we'll be needing daddy uranium by the time the Martian winter roles in. The light out here is weaker than on Earth, so our solar panels are less effective. That's ok, we brought plenty of blankets.

Also on our morning route, we found an easy ingress point to a large canyon 2km East of the Hab. It's quite picturesque and we'll definitely be returning. Maybe we can get the whole crew and take a "Grand Canyon tourist photo" while we're there. Why not? Maybe in the future, colonists will drag their children to visit the "first landing site" and stop by our little grand canyon.

As we ranged out from the Hab, our radio communication suffered noticeably. I think the engineers back on Earth missed a decimal point somewhere as coverage is spotty at best 2+ km away. This leads to frustration when trying to keep in touch, so we have to keep looking for high ground. It's annoying, but it's incredibly important. There are no cellular towers on Mars (yet), so they can't just track us by our FourSquare check ins. Luckily, we do have the MPS (Mars Position System) put in place years before our arrive and those little birds in the upper atmosphere make know where "we are" simple, we just need to know where everyone else is.

Speaking of radio problems, upon returning to the Hab from our morning EVA, no response was received to our radio queries and Habib and I began emergency checks to determine if the Habitat had lost pressurization and/or the crew had been incapacitated. We found the ERV (Earth Return Vehicle) intact and undisturbed, so the crew hadn't stranded us and we had a last ditch option. Next, we performed an emergency check of the Habitat exterior. After frequently unanswered calls, we opened the airlock manually, prepared to locate bodies inside but thankfully, the crew was fine and a dead radio was at fault. They trained us for these contingencies back on Earth, but it sure is something else when you suddenly realize all you might have to survive on is what's in your space suit backpack ...

During the afternoon, Commander Reynolds and Lisa conducted a short EVA to a nearby Table Top hill marked by the survey on our afternoon EVA last Sol. She collected 5 lbs of samples as the area is full of interesting geology different from sites visited previously.

From this experience of a short but fruitful excursion to a nearby area, we have planned 2 EVAs to nearby hills on foot. We'll investigate some interesting features and determine if these high points would be useful locations for future remote instrumentation.

ATV EVAs are great for scouting, but it's sometimes good to stop and smell the roses ... well, the Martian roses.



EVA Sol 6 B returning

Personal Notes

aggravitize, like acclimatize, not like aggro

we are the only people on the red planet, so new-wise we are it, the headlines are short and the only delay is via radio or the time it takes to ask “so what did you do today”, free-ing

you forget you can literally look and see another planet

woops, I forgot my razor, guess I’ll have a 2 year beard when we get back

hearing your resource usage is interesting, by having the pump make noise as you use water, you don’t want to annoy others and worst of all let them know you’re wasting resources

my first shower on Mars ... a short navy shower is all that’s required, humans didn’t bathe that much before 1900, but then again they didn’t live in airtight tin cans either

also, our space suits have to have the high contrast numbers, not only to tell us apart but to

I’m thinking of making a copy of the MDRS Eva suit, the backpack frame is an Outdoor Products [Dragonfly \(30 in frame\)](#) or [Firefly \(30 in frame\)](#)

Sol 7 / Dec 7



#MDRS Sol 7: Headed out today into the boulder fields East of Mars Base One. 20 mins of suit prep worth it every time.

Journalist's Report

Date: Sol 7 / Dec 7 2012

Written by: Dan Wilcox

There are certain features of the seemingly lifeless areas in many of Earth's deserts called cryptobiotic crusts where tiny microbes work to hold together soil, in essence slowing erosion and pioneering stable areas for plants to grow. Areas around the Hab are reminiscent of these earthling crusts, but this similar appearance could be explained away due to erosion/drying actions ... or there could be life teeming just under the surface. The biologists in the second Mars Mission should be able to tell us. We're just the pioneers finding the way. We as the first humans on Mars are a Terran cryptobiotic crust, slowly assembling bits and pieces of a cold, arid world together so the next missions can take root and grow.

After the glow of the initial landing has worn off, our routine has set in. We conduct EVAs during the day, with those staying behind performing maintenance or getting some downtime, and we plan future EVAs and write reports to Mission Control during the Martian evenings. There's not much sleep, as there are lots to do. Data to go over, maps to develop, and experiments to conduct. We're throwing our microbial tendrils out to find new resources and places to visit.

Today, as tendrils, we stayed in our own backyard and conducted EVAs to nearby locations on foot. Amazing stuff. Such variation between sandy stream beds to rocky hilltops to boulder fields. The morning EVA discovered what appears to be a petrified tree. As with the fossilized mollusk

shells found on Sol 3, this would be further proof of ancient life on the Red Planet and thereby increase the chance of finding life here now. You could say the Second Genesis theory is bearing out ... but that's another story.

The afternoon EVA returned to the tree marked in the morning, but couldn't find it. Looks like we need to return to our waypoint and navigation training, which we'll be integrating into tomorrow's EVA. It's amazing how you can miss things that don't seem too far away and should be easy to spot. Well, nobody said tendrils were accurate ... but we're working on it.



*Heading Out:
Waiting during the 5 minute decompression sequence*

Personal Notes

*current track: Haiti Vodou 8 - walk down/up drums!
(arpeggiate?)*

heading out into our own backyard, perfect weather

we are like the [cryptobiotic crusts](#) .. pioneers holding the soil together, a simple start for other flora and fauna in a barren wasteland

falling is not so bad, the gravity is less

the [Morrison Formation hills](#) here are full of [Bentonite](#)

Heading out each day with a full suit and backpack is hard work. Its a good thing we trained all those years back on Earth.

the importance of detailed map data ...

Sol 8 / Dec 8



#MARS Sol 8: We, the New Martians, collected watercolor pigments from Martian soil. Coming soon, art on the Red Planet.

Journalist's Report

Date: Sol 8 / Dec 8 2012

Written by: Dan Wilcox

Today is the first day on Mars when I didn't notice my helmet.

Our suits are custom tailored to each of our bodies and we've been wearing them in training for years, so they became a second skin. However, when you're actually on Mars itself, you become acutely aware of the fact that only about 2 cm of material is between you and certain death. We definitely remembered we were wearing them with our first steps onto the Martian surface.

Now that we've been here 8 sols and gone outside on EVAs for 5, the old habits are setting in and my suit is again an extension of me, just a big dress suit in the business of exploring another planet. We were out today collecting soil samples of what appears to be a dried clay powder similar to bentonite on Earth and I placed my pen next to sample point so it would be easy to tell in the photo how large the area was and what relative size the soil features are. When I picked it up to make notes on the location, heading, and MPS (Mars Positioning System) marker number, I noticed both my pen and notebook were covered in light red fines (very small particulate soil).

Naturally, I blew off the dirt and continued work.

And, naturally I suddenly felt pretty stupid when the inside of my helmet fogged for a second or two.

Our soil collection is precipitated by my desire to ask the question, how will culture on Mars divert from that on Earth? One answer would reference the Inuit and their score of words describing snow. Perhaps future Martians will have extra words for describing Martian soil and the colors red & yellow then those on Earth. Another answer might be via materials. What kind of cultural artifacts will be made on Mars? Options include sculpture from disused Hab hardware, space suit scarecrows, or, as I'm thinking, watercolors using natural pigments of the Red Planet. Today, I collected 6 samples ranging from brick red to grayish purple to white and some time during the next week, I'll check our food supplies for corn starch, baking soda, and vinegar to use as a binding agent for the fine colored rock powder.

Ok, we're wasting precious water on "art" but our reclamation equipment is successfully mining moisture out of the atmosphere, so we have a little extra to experiment. Besides, how much money is being spent on art and culture on Earth today? If people can spare a few bucks for their favorite band I can certainly spare a few mL of H₂O to kickstart the first Martian painting ... if only I had some actual drawing ability. Well, a first is a first, disregarding quality!

While I was collecting the colored bentonite samples, Lisa and Habib were doing a little orienteering training with both analog and digital compasses about half a kilometer north of the Hab. As they were following a heading to the North, their compass needles suddenly shot around to the West. Puzzled, they double checked their instruments and made a 20 meter arc towards the NW. As they walked, the

needle turned slightly with their angle, literally pointing to a local magnetic anomaly as something under the hillside is attracting the needle. This could be a kind of magnetized ferrous rock which indicates a raw material source for future iron and steel or it might be the entrance to a buried Martian city. I'm thinking the former is more likely, but the latter would be more exciting. We're planning on making a return trip to see if we can map a more precise location.

As I said before, we've been on Mars for a week now and each sol is beginning to blend into the next. There is a cycle of work: daily EVAs, food preparation, reports, communication with Mission Control, and planning for the next day. Not all the work is bad, as we had what is probably the first homemade chocolate ice cream on Mars (amazing what you can do with dried chemicals), but we are getting a bit worn with the routine. Therefore, Commander Reynolds has requested from Mission Control for a duty free day tomorrow, a day of rest which I believe is roughly Sunday in North America.

We'll get a rest but Mission Control won't. They're back with you working night and day to keep in constant touch with us and our vital systems as well as collecting and cataloging gigabytes of data. We are in contact every night and coordinate every change and question of resources and systems with them, from suit modifications down to what batteries to use with certain devices. They need to know exactly what our equipment and resource situation is to best help us deal with any contingencies.

We know we're in good hands.

Personal Notes

humanity standard mars

ask boat designers to design habitat, they already know how to maximize space & comfort

how will mars culture diverge from earth? what kind of sounds, smells, and stimulation will people be used to and/or missing?

dried food farts, they've all smelled the same since yesterday

each day blends into the other out here, we'll have a sunday break tomorrow, so at least there's some difference in the weeks

this is a place where one can wear thermal underwear, there is no fashion

of course, my nose itched just as we got outside in our helmets

today is the first day I didn't really notice my helmet: I tried to blow off dirt from my pen and notebook

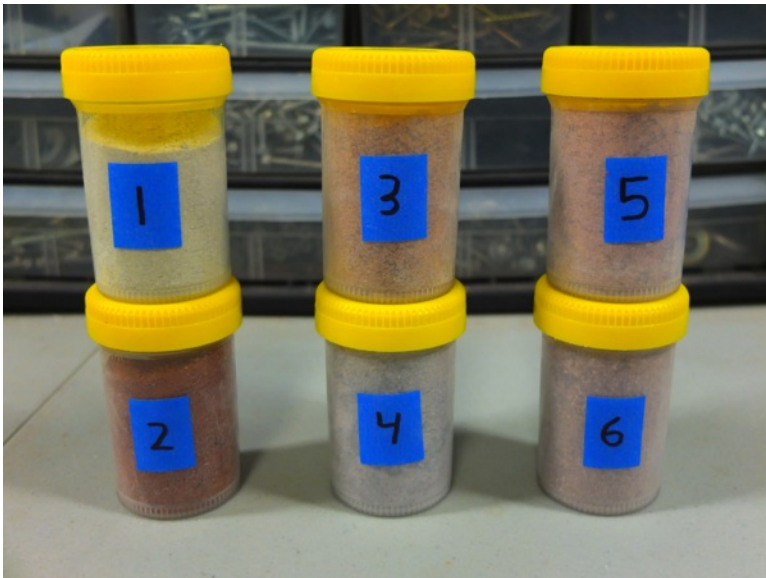
heading out on an EVA requires precious resources, so we must plan simple, defined objectives and work together as a team to maximize efficiency ... we didn't have that for today, it was 3 objectives at once without much teamwork, must improve next time

we have to coordinate every change, every question of resources and systems with mission control, even down to the label maker and up to suit modifications, yeah I know they need to know exactly what our equipment and resource situation is to best help us deal with an contingency's ... they want and need to be on the same page

... at the same time, how ever, relaying this information and making multiple cross decisions is frustrating ... we have to keep reminding ourselves that Mission Control is there to help us ...

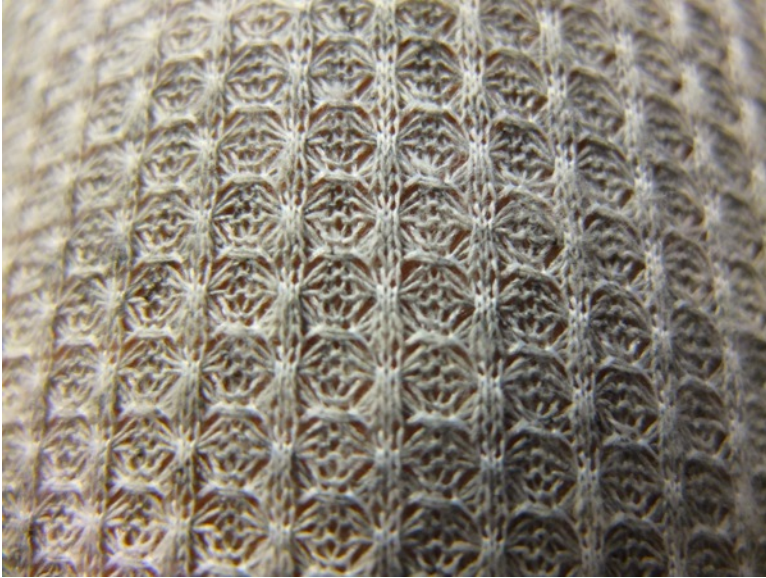
how to make [homemade watercolors](#), use clay soil samples?

current track: Mishima: Like some enormous music



Colored soil samples

Sol 9 / Dec 9



#MDRS Sol 9: This is a sol of rest. There will be no fashion for the New Martians. Only utilitarian waffle thermals.

Journalist's Report

Date: Sol 9 / Dec 9 2012

Written by: Dan Wilcox

Today was a recharge sol. Mission Control granted Commander Reynolds' request for a duty free sol last sol so we were allowed time to rest and catch up on personal time. There was an open comm window to connect to our families and I sent a message to my wife. The 20 minute delay for radio transmission from Mars to Earth is far too great for a real time conversation and I kept it short and simple.

We've been so focused on the tasks at hand that it's nice to stop for a moment and remember that which is truly important to us. We are here not for fame or glory but out of curiosity. We want to know, we want to explore. We are pioneers and we're braving this new world not only for ourselves, our families, and our countries, but for all of humanity.

That being said, it will be nice to down a cold one after we touch down on Terra in 2 years.



Paula set up the Musk Observatory and focused on nearby Jupiter, much larger and brighter than when viewed from Earth.

Personal Notes

downloading area topo maps from [TopoQuest](#)

would cannibalism be possible in a space crew on Mars? if we're pioneers, maybe we have to be ready when resources are low, think Donner Party or Andes Soccer team

we had an open comm window to connect to our families, I sent a message to my wife, we've been so focused on the tasks at hand it's nice to stop for a moment and remember that which is truly important to us

we are here not for fame or glory but out of curiosity, we want to know, we want to explore, we are pioneers and we're doing it for all of humanity

"Nooo. I don't want my spit pizza!" - Paula Crock

watched Capricorn One tonight, a good training film for when we leave ...

[Where is Mars?](#) [Mars retrograde dance etc](#)

Sol 10 / Dec 10



#MDRS Sol 10: Power went out early AM and we jumped to action! It's a cold night on Mars but a warm day of exploration.

Journalist's Report

Date: Sol 10 / Dec 10 2012

Written by: Dan Wilcox

Early this morning the power went off.

This is an annoyance on Earth but a big deal on Mars. We're completely reliant on our vital systems for oxygen, pressure, water ... everything we need to survive. Just when we were comfortable, here comes a quick dose of reality.

As the power went dead, a cacophony of alarm buzzers went off and we all jumped from a sound sleep into crisis mode. Emergency heaters were activated, spare oxygen brought out, seals checked, and a power plan assessment survey mounted. Those of us not checking the energy systems went back to our bunks to stay warm. The Martian night is a cold one and it doesn't take long for it to seep into the Hab.

In the end, one of the fuel pumps for the methane generator had malfunctioned as a result of the extreme cold. It seems a faulty heating element failed and was quickly replaced. We were back to Situation Normal in 3 hours. It was a simple enough problem, but a reminder of how quickly we could disappear if we're not careful.

The same goes for when we're out and about. As Commander Reynolds and I were out in the afternoon Martian sun double checking the curious magnetic anomaly detected last sol, I was reminded that even a turned ankle can be dangerous when speed and mobility are reduced in our EVA suits.

As for the the anomaly, we determined it must have been an instrumentation failure as we were not able to reproduce the movement of the compass needle. We even double checked if the EMF (electro magnetic frequency) coming from our suit backpacks was causing the phenomenon, but negative. There must have been a false positive last sol which is too bad, I was hoping to find the entrance to that hidden Martian city.

As a note to suit designers, how about adding unique patterns or numbers/letters to the bottom of each person's boots? This would make following the tracks from previous EVAs even easier. I know there are only 5 of us and we all have MPS (Mars Positioning System) units, but sometimes you just can't find the exact spot your buddy went the other day. I wear suit number 3 and if I see a print with the number 3, I'd know I'm following a ghost of myself from the past and that would be cool.

As we were returning to the Hab, the wind started to gust up again as on last Sunday. It was howling earlier but hopefully it will die down tomorrow so we can continue our roadbed survey. This time we head North and West.

After the 5 minute pressurization routine in the EVA airlock, we step in and slowly disassemble ourselves. First gloves, then helmet, then pack, then boots, then suit, back down to our thermals (premier Martian fashion). Afterwards, there is a curious, meditative down time where each person tends to their suit, performing maintenance, checking seals, performing diagnostics. These are our second skins outside

and we cherish and protect them just as they protect us from the extreme elements.

It's interesting how the suit doesn't feel heavy until after you're back inside.

Personal Notes

power went off at 5:56 am, it's a cold night on Mars, the diesel fuel froze, time to remember how important our vital systems are

the wind has returned, just as we came back to the Hab

astronauts must be extremely careful with every step, even a broken ankle is a big deal in this hostile environment, I remember that as we take a steep slope to summit one of the hills 1km to the north

there should be a utility airlock, just for small stuff and things you would forget

tracing the foot prints of other EVAs, maybe astronaut boots should have recognizable symbols of numbers to make it easy to tell who was there?

taking the suit off is like meditation / a cool down period of simple maintenance

Sol 11 / Dec 11



#MDRS Sol 11: We've found frozen water and microbial life on Mars! All in a day's work as pioneers on a new planet.

Journalist's Report

Date: Sol 11 / Dec 11 2012

Written by: Dan Wilcox

Today is another big day.

We found water and possible life on Mars.

But before that news, we were a bad crew this morning. As our routine has set in, we've been slipping a bit and sleeping too late the last few sols. I didn't set my chronometer last night and was awakened by a knock on my stateroom door: "This morning's EVA is cancelled." Commander Reynolds' decided we need to get ship shape again and we can all agree. Time is as much a resource here as are water and oxygen. We must strive to stay efficient and dedicated.

In the afternoon, we traveled north on an ATV EVA into undiscovered country.

As with some of our previous EVAs, we were surveying roadbeds and looking to identify areas for future investigation. This region is full of low, rolling colored bentonite hills similar to the area around the Hab and canyons to the north and east. There were several suitable roadbeds identified via orbital mapping before we landed, yet some of these have turned out to be harder to locate on the ground. We went right past forks that should have been there but weren't. We'll move forward with tomorrow's EVA by using more accurate waypoints instead of assuming the splits in the road will be easy to locate.

Robotic explorer's are great for some things, but it really takes people on the ground to deal with these kinds of problems. We can make assessments in the blink of an eye without requiring intensive image and instrument study over a 20 minute radio delay to Earth. Instant feedback, baby. Machines help, but humans are required.

But machines don't require water ... we do. That's why we were excited when Commander Reynolds discovered moisture in the Martian soil by inadvertently getting his boots muddy. We had stopped by what appeared to be an ancient stream bed so I could collect green bentonite pigment samples. Habib and Commander Reynolds poked about at what looked to be the remains of waterfall when the apparently bone dry soil at it's base turned out to be quite a bit wetter than expected. This is great news as locating water is a requirement for building larger settlements here on the Red Planet.

Buoyed by this discovery, every dip and shadow suddenly seemed ready to unfold new treasures. We continued on to a canyon located on the satellite maps to the north and descended about 15 meters to it's floor. Following the knowledge finding the mud had given us, we headed to the site of a similar ancient waterfall formation. Upon approaching, Habib suddenly started gesticulating for us to come closer and, hiding in the permanent shadow of the canyon's steep walls, lay a 4x3 m pool of frozen water. Water on the surface is a big deal when the ambient temperature is much lower than Earth's. Finding this pool indicates that there must be other areas of water which can possibly be utilized as springs to access the vast amount of frozen water underneath the planet's soil. I quickly

documented the pool and marked it's location so we can return to it.

We decided to explore the canyon further and I found just as monumental of a discovery up a side slope. A layer of green strata in the hillside caught my attention and, as I approached the top, I looked down to my left to see a 4 x 2m section of ground with peculiar 4–5 cm vertical clumps of dirt. At the tops of these clumps appeared to be black lichen, holding the soil together. This reminded me of the cryptobiotic crusts I mentioned in an earlier report: areas of microorganisms pioneering new soil for plants to grow, life in the apparently barren desert. I quickly photographed and marked this location, so we can ask the Remote Science Team at Mission Control for analysis. If this turn's out to be life, we have conclusive evidence that we are not alone in the universe as the chances of finding more life are exponentially increased.

As I retreated, I was careful not disturb the delicate ground. I don't want to be disrespectful to our new neighbors.

Personal Notes

sleeping in, the routine is getting too easy ...

time to teach mapping, now I love GPS stuff

have a headache

Sol 12 / Dec 12



#MDRS Sol 12: Found petrified trees, fossils, and gypsum shale. Life and resources tied together through colored soil.

Journalist's Report

Date: Sol 12 / Dec 12 2012

Written by: Dan Wilcox

As we're over 35 million miles from Earth, we can't just pop over to Walmart for supplies. If we don't have something, we try to make due with what's available. Now for some, this is an problem but for others like me, it's a creative limitation. Sometimes it's fun to see what you can cobble together with the materials at hand.

For instance, I've been collecting Martian soil pigments and carrying little plastic sample containers with me. First I had a baggies tied to my belt, but these are a pain to use with the suit gloves on. You have to reach in and fish around until you find an empty bottle which takes an inordinate amount of time as the bag swings back and forth. Annoying. Plus, one of them developed a hole and I left a Hans & Gretl trail of plastic bottles. Also annoying.

The other day, I came across an empty coolant jug leftover from power plant maintenance. It was the perfect size, so I cut the spout off and added an access hole in the side. A few zipties here and there made 2 compartments, turning it into a custom sample case. The bottom contains empty bottles which you fill with something and then drop them into the top through the hole where the spout was. Simple, easy to manipulate with gloves, and has a built in carrying handle. You'd think somebody on Earth would have thought of this first ... but maybe it requires that little bit of necessity.

The pioneer spirit.

As the first humans on Mars, we are pioneers looking for the new, the unexplored, and the unexplained. Everything here is new and we have the luxury of being able to walk over the next hill to undiscovered territory. With everything more or less explored on Earth, this is the new frontier and it's dangerous and exciting.

As for exciting, Commander Reynolds, Lisa, and Habib discovered evidence of more advanced ancient life and what appears to be petrified wood during this morning's EVA. At this point, we can't give out any further info as this find needs to be double checked back on Earth and by Astro-paleologists coming in the future. In any case, we here on Mars think this is big news and points to a definitive second genesis. Naturally, Mission Control will want to triple & quadruple check before saying anything conclusive. Unlike them, we see things pretty simply here, for better or worse.

On the afternoon EVA, Paula and I returned to double check the coordinates of this morning's discovery and then trekked out onto the plains above the Hab. We drove on through variable terrain towards the dark rim about 3 km to the West and the area is full of grays and blacks, much different from the red, banded bentonite around our home. I collected two pigment samples of nice dark grey and black powdered clay.

Along the crumbly, powdered clay plains below the rim, we noticed thousands of tiny points of light within the clay: light reflecting off of what appears to me to be gypsum. I collected a sample and, if verified by the Remote Science

Team, this can be another useful resource. From what I've read, gypsum can be used for fertilizer, to make plaster, as building material (sheetrock), and is a component of Portland cement. So our little foray might have already found useful materials to build a more permanent base. I'm proud.

I'm not proud however about what happened next: we got a bit lost.

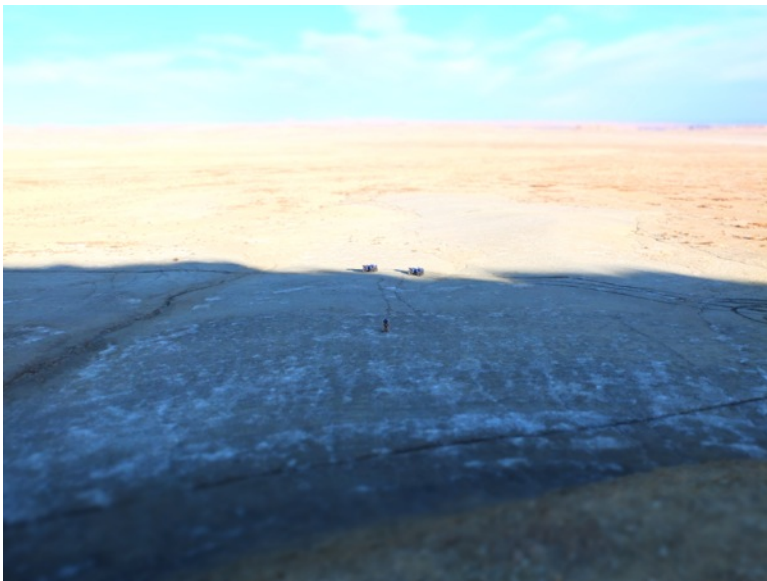
We were following a track identified on the satellite maps but just didn't seem to be in the right place on the ground. The simple answer was that it wasn't in the right place and we weren't in the right place. I had navigated us about 1 km off course to the south. Just when we thought we were good on time, we had to painfully backtrack. Luckily, I was able to rectify my faulty navigation by correctly locating our position and getting us back out the way we came.

Now this doesn't seem like a big deal, but it was getting close to dark and the surface temperature difference between a Martian night and day are extreme: -100 to 0 degrees Celsius! After spending 2-3 hours outside in the sun at 0 degrees, the cold seeps into your bones and you're looking forward to a warm Hab. Now imagine that at -100. Our suits aren't designed to withstand that temperature otherwise they would be far too cumbersome to use effectively. So when the sun started to dip towards the horizon, Paula and I were worried. In the end, we slipped in at least an hour before sundown, so all that ends well.

This little experience reminds me that every time we send an EVA team off and wish them luck that they'll return

again, our morale is high but we're all mindful of what's at stake. It may be dangerous, it may be scary, but it's worth every step onto our new world. We return to Earth in 3 days time. Will you come step in our footprints after we're gone?

Mars needs colonists.



In the shadow of the rim

Personal Notes

ingenuity with the materials at hand

sending the team off, wishing them luck that they'll return again, morale is high but we're all mindful of what's at stake each time we head out, radio comms are kept open and crews must stay within range at all times

we are pioneers looking for the new, everything on Mars is new, walking over the next hill opens up new area, with everything more or less explored on Earth, this is the new frontier and it's dangerous and exciting

afternoon EVA: returned to mark coords of fossil find, then did a long EVA out onto the plains to the west above the Hab, towards the dark rim about 3 km to the West, area is full of more grays and blacks, got two pigment samples of dark grey and black powdered clay

found areas of what appears to be [Gypsum](#) within the clay, can be used for fertilizer, to make plaster, building material, component of Portland cement, will ask the remote science team

super tired, doing this report grind is hard work, it really is, not much time to decompress (literally)

Sol 13 / Dec 13



#MDRS Sol 13: 2 days left! A long trek was cut short due to a malfunctioning pack. Glad to be back before turning blue.

Journalist's Report

Date: Sol 13 / Dec 13 2013

Written by: Dan Wilcox

Only 2 sols left before we bid farewell to our home here on the Mars and board the Earth Return Vehicle for the third planet. We've planned one last EVA tomorrow to take care of some unfinished business form today, then we write our final reports, do our system checks, and prepare to strap ourselves in tomorrow morning. By 12pm Earth time, we'll be off of the surface and onto a return trajectory to a planet with oceans of liquid water and an atmosphere more favorable to our form of life. It will be weird to be able to just step outside whenever we want without having to spend 20 minutes putting on a space suit and another 5 in an airlock. I have to say I will miss that routine as it reinforces how precious those few hours on the surface really are.

With each EVA, we learn more about our little bit of the Red Planet. This morning, Lisa & Paula returned to the area about 1.2 km E of the Hab in order to relocate what was thought to be a petrified tree during an EVA last week. It didn't seem like much of a possibility then, but subsequent discoveries over the past few days make it much more likely. While, in the end, they were not able to return to it, they did find a number of interesting brain-like rock formations whose MPS (Mars Positioning System) coordinates have been marked for future crews.

They also ran across what could be some sort of tracks. Now, we're not sure yet if these are really footprints, pawprints, etc and, if so, that they might come from a

currently living animal. Again, we're our way out so we probably won't be able to verify anything unless something comes and bites us on the nose during tomorrow's EVA. Who knows?

As with knowing and not knowing, you can never be certain when equipment will fail and you just have to be ready for it. Case in point, during this afternoon's EVA, Habib and I went for what was supposed to be a moderate walk but which turned out to be a slow slog through 1.2km of sandy ground. We were huffing up to a nearby summit to survey the area and the large canyon E of the Hab, when Habib's pack started to fail.

His pack. As in, his oxygen, power, and life support

A big deal.

We always double and triple check our suits before we leave every on EVA, but some things happen. In this case, it seemed like a faulty wire had come loose. We immediately went into survival mode and planned a direct return to where we had parked the ATVs which both contain emergency oxygen supplies. I applied a little "manual adjustment" with my fist to Habib's pack and it kicked back online before he turned blue. We next headed back those 1.2 km at double time before the pack gave up the ghost and hooked up the spare O2.

A close call, but as I've said in previous report's, all in a days work ... but we were sure glad when we stepped out of the airlock back into the Hab.

Personal Notes

Graveyard orbit

only 2 sols left before our return to Earth in the ERV, one last EVA tomorrow, then our final reports, system checks, and strapping ourselves

*possible album cover like Robbie the Werewolf: Live at the Whaleback, but with me turning into a spacesuit instead of a werewolf or perhaps a 3 stage evolution:
monkey -> human -> astronaut*

Dan's sample return container

you never know what's going to happen, when equipment will fail, you just have to be ready for it

Habib and I went for what was supposed to be a moderate walk, but was slow through slogging through sand, Habib's pack failed, We took the road North from the Hab, then E, then S and parked the ATVs at 12S 0520118E 4250881N. We continued on foot to Pinto Peak.

watched Outland, Sean Connery as a space marshall, sci-fi High Noon

Should the first lander on Mars have a doorbell?

Sol 14 / Dec 14



#MDRS Sol 14: Blasting off next sol. Snow on Mars kept us in the Hab, making final preparations for return to Earth.

Journalist's Report

Date: Sol 14 / Dec 14 2013

Written by: Dan Wilcox

There is snow on the red planet.

Frozen water was falling from the sky this morning. We must be closer to the influence of the poles than we thought and some sort of unknown weather pattern has brought on just the right conditions. It seems the Red Planet has all sorts of surprises waiting for those who brave the long journey. Unfortunately this beautiful weather has kept us inside as the fine sands and clays in the area appear to be turning into a layer of sticky mud. Maybe the planet is sad that we blast off tomorrow and is trying to keep us from leaving.

As a result of staying in today, I'm slow. We're all slow. There isn't the excitement and adrenaline boost of going outside of the Hab. Sure we have plenty to do, but I'm finding it hard to concentrate. I'm both excited to head home but sad to leave when there's so much left to do here. We'll leave that up to the next crew and bring back all we have learned.

Now that humanity has walked on another planet, we will return. Soon there will be new martians living here, ready to head on for the next world.

As I'm writing this, we are in the process of preparing for our flight in the ERV (Earth Return Vehicle). We've transferred over all of the samples and data we've collected and extra supplies we brought with us in the Hab or collected from the Martian environment. We're also doing a little cleanup

as we've lived here during the 6 month journey from Earth and the last 2 weeks. Why clean house? Well, the next crew is already on their way and nearby, within 800 km. The Hab can be used as a second base and further added onto when more crews made the trip. Our humble home will either be the nucleus of a new colony or some sort of museum piece that future Martian families will visit. Either way, I'm proud to have lived here, so it's best to leave a tidy ship.

As part of our preparations, we're writing our final reports to Mission Control and the maps and relevant scientific data are being collected to be sent off as a backup in case we don't return. I'm sure we will. In any case, we've accomplished much during our short stay and I leave you with the opening to our Mission Summary report:

The crew of the Phoenix One successfully landed the first manned mission to Mars. Over the course of our 2 week stay, we have explored and mapped our surrounding area, found water on the surface, discovered microbial life, and identified numerous sites for study by future crew, shaken down systems, and conducted several human factor's and engineering studies. We've proven that both living and working are possible on another planet and that we are not alone in the universe.

As pioneers, every step we have taken at Mars Base One has paved the way for countless crews.

Look up into the sky, we're looking back. Join us.

Dan Wilcox, Journalist for Crew 119 of the Phoenix One, signing off.

Personal Notes

to the tune of Smoke on the Water:

“snow on the red planet, frozen water falling from the sky”

*we're closer to the influence of the poles than we thought
conditions keep us inside as the fine sands and clays on the
area sticky mud, maybe the planet is trying to keep us from
leaving or sad that we blast off tomorrow*

it's windy outside now

kind of anticlimax, but it's ok, just too much work

*internet went down during final comms, John's SETI@Home
killed it, the search for extraterrestrial life blocks us from the
terrestrial kind*

Dec 15-16



#MDRS Sol 15-16: The Martian sky bids farewell. Orbital insertion was go & back on terra firma, but missing Ares.



Crew 119 finishes the MDRS handover to Crew 120 sans air.

Mission Summary

Author: Dan Wilcox

Date: December 14, 2012

The crew of the Phoenix One successfully landed the first manned mission to Mars. Over the course of our 2 week stay, we have explored and mapped our surrounding area, found water on the surface, discovered microbial life, and identified numerous sites for study by future crew, shaken down systems, and conducted several human factor's and engineering studies. We've proven that both living and working are possible on another planet and that we are not alone in the universe.

As pioneers, every step we have taken at Mars Base One has paved the way for countless crews.

Crew 119

- Commander John Reynolds
- XO/HSO Paula Crock
- Scientist Lisa Stewart
- Engineer Habib Palenfo
- Journalist Dan Wilcox

Objectives

- Explore & map the surrounding area
- Identify sites for detailed investigation by future crews
- Shakedown systems and procedures
- Conduct human factors and engineering studies

Exploration

Explored the area 3 km to the East and West, 5 km to the North, and 3 km to the South for the Hab.

- mapped and checked suitability of nearby roadbeds
- discovered liquid water in the soil
- discovered frozen water on the surface
- found microbial life in the form of a cryptobiotic crust
- found evidence of ancient life:
 - mollusk shells
 - petrified tree
- found fossilized evidence of ancient vertebrate life
- found resources in sand and Mancos shale clay (contains gypsum, various minerals, and possible uranium)

Identified Points of Interest

Waypoint locations are being compiled. The details and results will be forwarded to Mission Support.

- Located and verified road forks
- Cryptobiotic crust
- Various geological formations
- Marked the location of several survey markers

System Shakedowns

General

- General systems maintenance (Habib)
- Shakedown of Mars landing and support systems
- Shakedown of comm systems & protocols

EVA Suits

- Designed and tested removable air direction system to reduce in-helmet likelihood of fogging
- Troubleshooted and fixed faulty charging systems for #5 and #6 backpacks (Note: polarity of #5 charging cable is opposite compared to all other backpacks)
- Missing wire loop for rear latch on #2 helmet replaced

Musk Observatory

- Fixed observatory dome shutter closing sensors
- Fixed mis-alignment between finder scope and main telescope in observatory
- Demonstrated operability of observatory hardware and software by producing clear images from the ccd camera

NorCal Max Rover

- Effective range ~ 60m from Hab
- Was great for checking the outside condition of the base without having to mount an EVA
- Dan wrote a shell script to convert the GPS log file to kml (emailed to Scott)

- Definitely have to be careful where you drive, it's easy to get stuck and not be able to see what's in the way or if the tires are caught on something
- There seems to be an issue where the joystick going forward stops working and you have to unplug/replug the joystick and restart the app for it to work again

Human Factors and Engineering Studies

Human Factors Observational Study (Lisa)

All crew members participated in a daily assessment survey, a mid-rotation focus group meeting, and an experimental production and consumption project. These results will be combined with the data collected from the three-part "Mission to Mars" online decision-making survey also completed by crew 119. The online "Mission to Mars" study is on going throughout all 2012-2013 field season crew rotations.

Simulation Suit Temperature and Light Intensity Logger Prototype (Paula)

Tested the prototype and collected temperature and light intensity data from 3 EVAs of differing temperature conditions; collation of data and observations to be sent to Kent Nebergall to incorporate into full implementation study in February.

Simulation Suit Helmet Visibility Study (Paula)

Collected data under two light conditions for a range of filters; data successfully span range of break-down in task

completion time due to limited visibility through helmet visor.

Seed-soil Optimization (Lisa)

The aim of this study was to identify optimal soil component mixes for seed growth using analog-Mars resources. Applying design of experiment (DOE) statistical methods, three distinctly different Mars-analog surface material samples, moisture, and organic mater mixes were tested. The germination and growth of a seed combination composed of complimentary herbs having medicinal, culinary, and soil enhancing properties were monitored. The preliminary results were unexpected and further off-analog investigation is anticipated.

Terracotta Water Filter (Lisa)

Clay has long been used on Earth as a material for water pipes and containers and could also serve that purpose on Mars. Australian National University materials scientist Tony Flynn has further demonstrated that clay combined with organic material can be used as a filter to produce safe drinking water. This project attempted to test the viability of this application with Mars-analog clay. Results were inconclusive and additional off-analog investigation is anticipated.

Rock-sample Collection (Lisa)

Rock, shell, and petrified wood samples have been collected and labeled for distribution to elementary school

children in the San Francisco, CA and Washington, DC areas.

Martian Soil Watercolor Pigments (Dan)

Collected colored samples of Martian soil to be used as the pigments for homemade watercolors. Further testing will be conducted, colors made, and a painting painted during the return to Earth. These results will be forwarded to Mission Support.

Addendum

Beyond the exploration and scientific study performed, there were also a number of other notable activities:

- Celebrated first birthday on Mars (Dan)
- Made and consumed the first ice cream on Mars (Commander Reynolds)

Daily Synopses

Sol 1: Successful landing, sent out rover, performed maintenance & familiarization

Sol 2: Performed maintenance & preparation for first EVA

Sol 3: First steps on Mars, discovered fossilized mollusk shells: evidence of ancient life, celebrated first birthday on Mars (Dan)

Sol 4: Planning day for farther ATV EVA roadbed surveys

Sol 5: Soil collection at Gateway, went N and W, found farther road

Sol 6: Mapped loop, found sand, located ingress to canyon E of Hab, visited nearby formations

Sol 7: Found what may be petrified tree, found interesting erosion formation (looks like bones in side of hill)

Sol 8: Collected pigment samples, located probable magnetic anomaly

Sol 9: Duty free day (No EVAs)

Sol 10: Power went out, magnetic anomaly revisited but ruled out

Sol 11: Found water and microbial life (cryptobiotic crust)

Sol 12: Found confirmed petrified tree and fossilized evidence of ancient vertebrate life, collected 2 pigment samples, found further resources: Mancos Shale (gypsum, minerals & possible uranium)

Sol 13: Located interesting rock formations near the Hab (Brain erosion), trekked toward eastern canyon and confirm egress at 1 & 2, had to return due to suit malfunction

Sol 14: Snow on Mars, there must be some sort of weather pattern not seen before that brought moisture into the atmosphere, stuck inside due to these conditions, Paula performed action studies

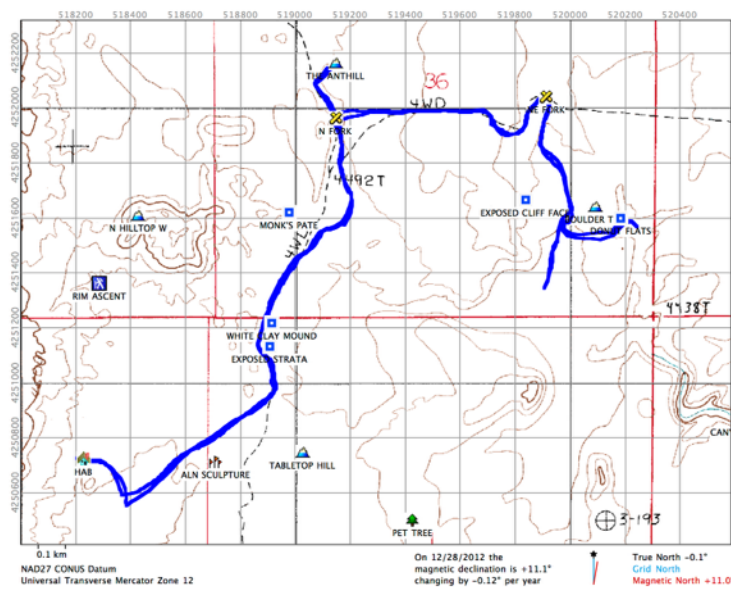
Sol 15: Final preparation, ERV launch



All EVA tracks, red for morning & blue for afternoon EVAs

Mapping

I planned many of the EVA routes and wrote plenty of the EVA mission reports. For each EVA, I made sure we had a GPS device recording the EVA track and compiled a detailed map including landmarks, waypoints, and points of interest.



EVA Sol 5 B

Example EVA Report, Sol 11

Date: 11 Sol / 11 Dec 2012

Written by: Dan Wilcox

EVA Sol 11 A

Type: ATV

Duration: 2h 18m 13:43 - 16:01

Distance: 18.16 km

Note: This EVA was moved to the afternoon as EVA Sol 11B was cancelled.

Crew & Equipment

- Leader: John Reynolds, Suit 1
- Nav & Steno: Dan Wilcox, Suit 3
- XO: Habib Palenfo, Suit 4

Points of Interest

1. 12S 0519913E 4252040N Road Fork on NE corner of loop E of Hab
2. 12S 0520760E 4251938N Intersection with Road coming from the E
3. 12S 0519147E 4251962N Road Fork N of Hab
4. 12S 0519470E 4255960N Road Fork near Interesting Canyon
5. 12S 0518243E 4256232N Interesting Canyon
6. 12S 0517642E 4254824N Road Fork to NW

Objectives

1. Find second roadbed to NE between 12 519913E 4252040N & 12 520760E 4251938N
2. Survey roads to the north of the Hab
3. Investigate canyon at 12S 0518243E 4256232N

Results

Objective 1 not completed. We were not able to locate the roadbed either from approaching for the W or returning along the identified portion of the road from the E.

Objective 2 partially completed. We were not able to find either of the forks off of the northern road. These have been identified on sat maps and will be returned to on tomorrow's EVA Sol 12 A.

While I was collecting green pigmented bentonite (Pigment Sample #7) at 12S 0517960 4254024, Commander Reynolds discovered moisture in the Martian soil on the bottom of a stream bed at 12S 0517923N 4254021E when he stepped his boot into a muddy depression. This find urged us to look in similar areas for more water.

Objective 3 completed

Investigation of the canyon yielded 2 points of interest:

- 12S 0518225 4255897: a 4 m x 3 m pool of frozen water in a shadowed depression
- 12S 0518258 4256037: what appears to be a Martian cryptobiotic crust

I also collected further green pigmented bentonite (Pigment Sample #8) at 12S 0518224 4255930.

Lessons Learned

1. As originally thought, we can't rely on sat map intel only as roadbeds identified from orbit have turned out to be harder to identify on the ground. We'll move forward by using more accurate waypoints for the road forks instead of assuming they will be easy to locate.
2. Water is within 10 km of the Hab!
3. Evidence of current life may have been found in the form of a Martian cryptobiotic crust. We'll relay the photos to the Remote Science Team for further deliberation.

EVA Sol 11 B

Cancelled due to crew's late wake up time via Commander Reynolds' discretion.

Pigment Samples



I collected colored soil samples to return with the "colors of Mars" for possible use as paint pigments. Each sample was documented with photos and a GPS coordinate. All samples were compiled into a report and averaged for a color palette.

See separate MDRS Crew 119 Colors of Mars sheet.

The Author

Artist Statement

Dan Wilcox is an artist, engineer, performer, and musician who combines live musical performance techniques with experimental electronics and software for exploration into themes of science fiction, space travel, cyborgification, and far futurism.

An engineering background tempered by a punk rock craving for raw energy of expression, risk, and humor leads to work that is robustly made yet spontaneously executed: a technological caveman beating a drum with an iPad, a musical cyborg thrashing in a spaghetti of purposefully connected cables, advanced computer software which tracks man boobs, balloons, and transforms words into moving mouth shapes.

Dan's ongoing robotcowboy project is a morphing human/machine and art/technology hybridization which acts as a platform to explore themes of technology and science fiction: a live cyborg punk rocker tenuously tethered to a wall socket to an intrepid astronaut heading out to discover the music of Mars.

He hails from the Rocket City, Huntsville AL USA, and strives to move forward, get ahead, and give the past a slip.

Biography



Dan Wilcox was born in Southern California and grew up in Huntsville, AL aka The Rocket City. His father is an aerospace engineer and he grew up around science, technology, and space craft. He went to college to be a Computer Engineer but got into playing music in punk rock bands and ended up studying Art & Technology in Sweden. In the frozen North, Dan got into experimental music and performance, resulting in his one man band cyborg performance project: *robotcowboy*. He took this project to various music festivals in Europe and on a 2 month tour around the US in spring 2008. Afterwards, Dan worked for 2 years at the Ars Electronica Futurelab in Linz, Austria creating interactive art installations and performances for museums and clients. In 2010, he was accepted to the Master of Fine Arts program at Carnegie Mellon University and is currently working on his thesis project, a concept album and live show around the theme of humanity going to the Red Planet, *robotcowboy: Onward to Mars*, which premieres in May 2013.

