HEADING TO MARS
MDRS FIELD JOURNAL, CREW 119

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ABSTRACT

This paper presents *Heading to Mars*, an artist book and exhibition compiled from notes, photos, and journalist reports from the author's posting at the Mars Society Mars Desert Research Station, Crew 119, December 1-14 2013.

As crew journalist, my mission was to document what life will be like for the first humans on Mars from "a feet on the ground" perspective. This work was research for my MFA Thesis project: *robotcowboy: Onward to Mars*, a live musical performance and concept album around the theme of humanity crossing the sea of space and touching down on a familiar new world.

KEYWORDS

Analog Mars Research and Research Stations

INTRODUCTION

What does it feel like to stand on another planet?

As of 2013, over 500 people have flown in space, 24 of which have traveled beyond low Earth orbit, and of these only 12 have stepped foot on the moon. This means only 12 people (all men) can tell you what it's like to stand on another astronomical object.

Countless science fiction books & movies have covered this subject, but nothing can truly compare to real life experience. With this in mind, various space programs and organizations have developed analog simulations, or "analogs". Current NASA astronauts train for International Space Station space walks at NASA's Neutral Buoyancy Laboratory [1], the Apollo astronauts practiced docking and landing on the Moon using elaborate computerized simulators [2], and researchers at NASA Ames conduct "Mars missions" at Haughton crater on Devon Island in the Canadian arctic. [3]

The Mars Society, a nonprofit space advocacy group promoting human exploration of Mars, initiated the Mars Analog Research Station (MARS) program in the early 2000s to build a series of Mars-like centers for experiential research:

> *In these Mars-like environments, we will launch a program of extensive long-duration geology and biology field exploration operations conducted in the same style and under many of the same constraints as they would on the Red Planet. By doing so, we will start the process of learning how to explore on Mars. [4]*

The Mars Desert Research Station (MDRS) in eastern Utah is the second deployed station in the MARS program [5], after the Flashline Mars Arctic Research Station (FMARS) on Devon Island in Canada. Operated for over 10 years, the MDRS selects applicants for both domestic and international crews consisting of scientists, engineers, astronauts-in-training, & artists for 2 week shifts in seasons stretching from fall to spring (Figure 1). Crews arrive with an overall mission plan and work with Mission Support day-to-day to coordinate resources, scientific data, EVAs (Extra Vehicular Activities), and crew medical information over a simulated communication delay. Similar to real world space missions, each crew member performs duties related to their background and expertise and are assigned one or two roles, including that of commander, executive officer, flight surgeon, engineer, journalist, & scientist - with the latter usually related to a specific field (i.e. astronomer, biologist, geologist, etc).

Crew members conduct EVAs wearing MDRS simulation suits complete with dome helmets and backpacks with a simulated air supply (Figure 2). They must wait through air lock decompression and sterilization procedures when leaving their cylindrical 8 meter diameter Habitat (HAB) structure. The isolated MDRS Utah high desert location is within the geological Morrison Formation whose red & gray colored clay layers and lack of vegetation contribute to a very Mars-like locale. These elements combine for a high state of immersion for crew members, where the suspension of disbelief can occur and the experience of standing on another planet begins.

In the fall of 2012, I applied and was accepted for MDRS Crew 119.

I'M NOT AN ASTRONAUT, BUT I CAN PLAY ONE ON TV

I am an an artist, engineer, musician, and performer who combines live musical performance techniques with experimental electronics and software for exploration into themes of science fiction, space travel, cyborgification, and far futurism. My father was an aerospace engineer, I grew up in the Rocket City (Huntsville AL), and have performed in Europe and around the US with my one man band cyborg performance project, *robotcowboy*.

As an artist with a background in computer engineering, I feel that my role is to perform "Research & Development for humanity". For me, art is like philosophy - you play with ideas and pose questions through visual work or performative action. My tools are not paint brush and canvas, but hardware and software: the medium of our current age. Due to my background, my work is a constant tug of war between utopian engineering perfection and the wants/needs of our literally squishy existence. I enjoy creating performative systems which both project a complete ideal yet contain an integral aspect of chaos, from the computer vision translation of my slippery mouth to performing in a cyborg system that can crash at any moment: *robotcowboy*.

robotcowboy

robotcowboy is a wearable computing platform to explore new types of man-machine music & artistic performance. Embedded computing, custom software, and audio electronics are utilized to build portable, self contained systems which both embed and embody the computation on the performer. The first incarnation of the project, called *robotcowboy: Cabled Madness*, is a cyborg suit consisting of the wearable computing & audio hardware mounted on a "Batman utility belt" and a working computer monitor helmet complete with built in camera and video goggles (Figure 3). The result of my 2007 Master of Science thesis [6], *robotcowboy: Cabled Madness* performed at various music and art festivals in Europe and the US from 2006-2011, including a 2 month tour in 2008.

robotcowboy was always meant to be a platform to explore different ideas, but by 2009 it had solidified into a single act without a driving concept beyond the conceptual requirements of the system. It was time to look to a new *robotcowboy*.

robotcowboy: Onward to Mars

It's been 45 years since the last Apollo astronauts left the moon and Buzz Aldrin laments on the cover of the MIT Technology Review [7] (Figure 4): "You promised me Mars Colonies. Instead, I got Facebook." If we didn't go then, why don't we go now?

For the next *robotcowboy*, I returned to my childhood interest in spaceflight. Research into NASA's intentions for a Mars mission in the 2030s [8], private organizations such as Mars One which want to start colonization in the 2020s [9], and near future plans for planetary exploration mostly lead to Mars. This could be something we'll all be watching live on TV in the near future.

With this in mind, I decided the new *robotcowboy* would head to Mars. The cyborg suit becomes a space suit and the wearable computer is now built into the life support system backpack: the cyborg is now an astronaut. This new show is designed to convey the realities of a contemporary Mars mission through performance and music in order to bring this discussion to new audiences. The basic pitch is: "new wave rock band DEVO and performance artist Laurie Anderson meet astronomer Carl Sagan on the Red Planet."

I'm not an astronaut, but I can play one on TV. As an artist with an engineering background, it was time to do my "R&D for humanity" by getting a "feet on the ground" perspective at Mars Desert Research Station.

(For detailed information on *robotcowboy: Onward to Mars* see the accompanying paper *robotcowboy: Onward to Mars, A One Astronaut Space Rock Opera* in the 17th Annual Mars Society Convention proceedings.)

HEADING TO MARS

I applied and was accepted to be the Journalist for Crew 119, the first crew rotation in season 12 at the Mars Desert Research Station. *Heading to Mars* is my MDRS field journal compiled from journalist reports, tweets, photos, & personal notes arranged by Sol (Martian day).

Crew 119

I was part of MDRS Crew 119 and we named our spacecraft the Phoenix One (Figure 5). We were the first crew for the 2012-2013 season and our rotation was Dec 1st - 14th, 2012. Each member of our 5 person crew had a specific role based on their expertise:

- Commander John Reynolds, pilot
- Executive Officer/Health Safety Officer Paula Crock, physicist / satellite data analyst
- Engineer Habib Palenfo, mechanical engineer / pilot in training
- Scientist Lisa Stewart, sociologist / psychologist
- Journalist Dan Wilcox, artist / engineer / musician

Although my official role was that of crew journalist, I also planned EVAs, wrote mission reports, and compiled maps and points of interest.

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.

Our mission goals were:

> *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*
> - *Pioneer Martian soil usage*
> - *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. [10, p. 15]*

Journalist Role

As Crew Journalist, I wrote a daily report in this "first landing" perspective and compiled pictures to send to MDRS Mission Support for official press release to the MDRS Mission Reports page and the Mars Society Facebook page. My images were published to the MDRS Flickr account and some are

used on the MDRS & Mars Society webpages. Simultaneously, I personally tweeted the experience from my @danomatika Twitter account, condensing the day into 140 characters and a single photo. (Figure 6)

Additionally, several of my photos were featured in online articles about the MDRS, including Space.com [11] and German online architecture magazine BAUNETZ WOCHE's special on *Escapism*. [12] (Figure 7)

Crew engineer Habib Palenfo and I brought portable action cameras which we mounted to both the EVA suits and the MDRS teleoperated rover. In all, we recorded about 30 GBs of digital video, including several full EVAs with first person views for multiple crew members.

Book

After returning to Earth, this information was compiled into a 6x9 inch book (Figure 8), *Heading to Mars*, which was self published using the Espresso Book Machine at the University of Pittsburgh, ISBN 2810000150197. It can be printed at any time and both PDF and EPUB versions can be downloaded from my website: danomatika.com/projects/heading-to-mars. *Heading to Mars* was also featured in a 2013 print ad for the EBM. (Figure 9)

The *Heading to Mars* minimal cover design (Figure 10) consists of two space suit line drawings on a grey background. The front cover is an MDRS sim suit while the back is an MIT Bio-Suit inspired compression suit mockup built as a prototype for *robotcowboy: Onward to Mars*. The compression suit didn't test well with audiences ("it doesn't look like a space suit"), so it was replaced by the second prototype, an MDRS sim suit-inspired design, for the show.

The following subsections contain excerpts from *Heading to Mars* arranged in chronological order. Tweets are begun with *"#MDRS"* hashtag and most chapters are listed by "Sol" which is a Martian day.

Training: Physical Training

> *Movement and agility exercises on simulated Martian soil. Before traveling across space, astronauts must train for the rigors of a hostile new world. [10, p. 12]*

Part of my preparation for the MDRS in November 2012, I conducted movement exercises on a stand in for the surface of Mars: the red clay soil of my hometown, Huntsville AL and location of NASA's Marshall Space Flight Center, the US Space & Rocket Center, and Space Camp. (Figure 11)

T-minus 2 days

> *It's weird to prepare for going to Mars the day before going, like going on a hike. [10, p. 19]*

Readying to leave for Utah, I was struck by how my everyday experience was about to transform into an extraordinary mission to Mars. I was committed to the simulation before I even left.

Sol 1

> *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. [10, p. 24]*

Being the first crew of the season, the MDRS Engineering Team gave us the MDRS orientation and conducted the handoff of the station before returning to Earth. Once alone, we chose bunks and familiarized ourselves with all aspects of our new home on Mars, including our MDRS sim suits. I was an eager guinea pig and was assigned suit number 3. (Figure 12)

> *#MDRS Sol 1: Have suit, will travel. The music of Mars is decidedly Johnny Cash's "Walk the Line": thin, dry, & distant. [10, p. 23]*

Sol 2

> *Personal Notes*
>
> *I'm pushing for a long EVA, I mean one where I need to have a urine collection kit installed (which we have) [10, p. 28]*

Due to high winds, our first EVAs were cancelled, so we spent most of the day training and planning our EVAs for the next few sols. Going out on the Martian surface is not like simply bundling up on a cold day. Wearing a space suit and depending on limited resources means you need to plan and anticipate any problems which may occur, including the built in limitations of your own body.

Sol 3

> *Personal Notes*
>
> *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 [10, p. 38]*

Sol 3 was our first step on Mars, an exhilarating moment and beginning of the serious task of exploration. As per our mission goals, we scouted our immediate landing site and checked for any signs of damage to the HAB (Habitat module) exterior. Our movement tracks were recorded via Mars Positioning System (MPS) units for both mapping and the EVA mission report.

After living on a planet where most places have already been explored, it was quite amazing to feel that **no one** has ever stood on this spot before, **no one** has ever walked over that hill, and **no one** has

ever seen this view before. It felt empowering and exciting to be in a position to both see and name landmarks.

Sol 6

> *#MDRS Sol 6: Roamed far and wide today but sometimes the best things are in your own backyard, even on Mars. [10, p. 41]*

After our successful landing and first footprint on Mars, the next few Sols were spent roaming farther and farther from the HAB looking for suitable grades for future trails and roadbeds to new destinations. For the Sol 6 EVAs, we decided to forgo our rovers, stay purposefully close to the HAB, and focus on collecting rock samples for analysis by the Remote Science Team. Sometimes you can miss the important things in your own back yard.

> *Personal Notes*
>
> *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 [10, p. 45]*

Resources are scare on Mars. Water and oxygen are collected from the atmosphere or sublimated from the permafrost around the landing site, but this takes time. We conserve and recycle every useful amount we can and this means no long, hot showers … ever. It's a waste of water and a waste of energy to heat said water. The simple solution is the "Navy shower", a staple of Earthbound submariners: on, rinse, off, lather, on, rinse, off. Our lightweight clothing is designed to wick away sweat and odor but, to some extent, the HAB will always be a locker room with multiple people sharing a relatively small space. Luckily, the human brain knows how to ignore certain smells after a while.

Sol 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. [10, p. 47]*

As we gained proficiency with our equipment, EVA suit up dropped from 40 minutes to 10 by the end of our mission. Even so, that time was always communal as it takes at least 1 assistant to help donning and doffing (Figure 13). What would seem like an ordeal just to head outside quickly becomes normal, just as one grows accustomed to putting on hat, gloves, boots, and a jacket come winter.

Sol 8

By now, life at the MDRS had become routine, from cooking with dehydrated food to writing mission reports every evening. So too had wearing the MDRS sim suits, so much so, that I felt it became a "second skin" and there was a moment where I forgot I was even wearing it:

Journalist's Report
Date: Sol 8 / Dec 8 2012
Written by: Dan Wilcox

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 the 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. [10, p. 52]

Sol 9

#MDRS Sol 9: This is a sol of rest. There will be no fashion for the New Martians. Only utilitarian waffle thermals. [10, p. 57]

Everything taken into space has a purpose. At this point in our technological development, we don't have the luxury of being able to take all of the extra stuff we may have on Earth with us. We have to stick to the essentials, which include clothing. After more than a week at the MDRS, I decided that there would be no fashion on Mars for at least a generation since you only need two garments: utilitarian waffle thermal underwear and a space suit. Or at least I do.

Personal Notes

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 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 [10, p. 60]

Questioning resources, in my personal notes, I wondered if, under dire circumstances, how far astronauts would go to survive in a stark pioneer setting. At the same time, I was reflecting on the nobility of the pioneer's efforts. In many ways, the first hand perspective was drawing up all sorts of questions that never would have occurred to me without it.

Sol 10

Journalist's Report
Date: Sol 10 / Dec 10 2012
Written by: Dan Wilcox

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. [10, p. 62]

As the old saying goes: you forget about what you have until you lose it. In this case, we had become complacent about our electrical power source as we were focused on the daily tasks at hand and the system had been working flawlessly. That is, until the early morning of Sol 10 when the MDRS power generator seized in the cold of the Martian night.

Personal Notes

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 [10, p. 64]

The suits and the nature of our EVAs were constant themes in my notes.

The Apollo 11 live TV coverage revealed the difficulty of telling the astronauts apart and subsequent versions of the A7L moon suit incorporated red stripes for the commander. The Space Shuttle-era EMU suit continued this trend and the MDRS suits have their own version of this solution with red numbers sewn onto each backpack. This is perfect for recorded media, but not when following footprints, as we ended up doing on one particular EVA. It made sense to me, then, that perhaps future suit designers could incorporate a number, pattern, or symbol on the soles of the boots in order to make footprints individually identifiable. It works for the Mars Science Laboratory. [13]

For me, the MDRS sim suit became my business suit for the job of exploring another planet. After each EVA, you carefully doff your suit, check your equipment, and prepare it for your next outing. This whole process is a cool down where you collect your thoughts in a quiet space after having been out in the open of a hostile environment.

Sol 12

Personal Notes

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 [10, p. 74]

Like the pioneers of old, the new pioneers will seek out discoveries and resources on the new frontier. During our scouting EVAs, we documented locations and took samples of various types of rocks and minerals in the region surrounding the HAB.

#MDRS Sol 12: Found petrified trees, fossils, and gypsum shale. Life and resources tied together through colored soil. [10, p. 69]

Major discoveries for Crew 119 included finding areas of ice and liquid water in the Martian summer sun within a couple kilometers of the HAB and what could be fossilized animal remains from an ancient Martian seabed. The former is easy to confirm and we sent on photos of the latter to the Remote Science team for detailed analysis.

From sand, to water, to gypsum, to fossilized remains, to unusual rock formations, we collected as much data as we could to forward to the remote science team. Since the next shipment of raw material comes in the space of 2 years, it's best to plan on using what's around you.

Dec 15-16

#MDRS Sol 15-16: The Martian sky bids farewell. Orbital insertion was go & back on terra firma, but missing Ares. [10, p. 83]

Our last day at the MDRS was spent packing up and handing over the station to Crew 120. It was a bittersweet time for us and an exciting time for them, but such is science and exploration: for every question answered, a new one awaits.

Mapping

Through mapping, my goal was to catalog our exploration and its focus on pioneering routes and resources.

I was involved in EVA route planning and the writing of the post-EVA mission reports. Each EVA included a "Mars Positioning System" device (GPS at the MDRS) recording our tracks and new terrain knowledge which I used to compiled detailed maps including landmarks, waypoints, and points of interest (Figure 14). At the end of the mission, these new Points of Interest (POIs) were compiled into a separate *Crew 119 POI* document for use by subsequent crews and all EVA maps were merged into a single overall map colored by EVA time, morning or afternoon. (Figure 15)

Pigment Samples

On EVAs during Sols 8, 11, & 12, I collected soil samples to return with the "colors of Mars" for possible use as water color paint pigments. Each sample was taken following the basic MDRS geological sampling guidelines with notes on location, time, and photos of the sample area with reference object and orientation. (Figure 16)

All samples were compared (Figure 17) and compiled into the separate *Crew 119 Colors of Mars* report with 2 resulting color palettes: natural and saturation-enhanced to increase contrast. (Figure 18)

Crew 119 Mission Summary (Excerpt)

> *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 crews, shaken down systems, and conducted several human factors 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 many crews to follow. [10, p. 84]*

EXHIBITION

Several months after returning to Earth, my MDRS book, photos, video, & pigment samples were part of the 2013 Master of Fine Arts graduate group exhibition [14] titled "Basement Miracle" at the Carnegie Mellon University Miller Gallery, March-April 2013. My presentation, *Onward to Mars*, was both documentation of my research experience as part of the MDRS Crew 119 and a lead in for the upcoming *robotcowboy: Onward to Mars show*. (Figure 19)

Research artifacts from the MDRS included a "Mars rock" sample (what exhibition about space would be complete without one?), 10 pigment samples in their collection bottles (Figure 20), and video of Crew 119 EVAs in the field provided by fellow crew member Habib Palenfo (Figure 21). Five photo prints were carefully selected to convey both the momentous nature of Mars exploration and the day-to-day reality of those on the ground through the contrast between my MDRS photography and the accompanying personal notes used for the captions (Figure 22). They were ordered chronologically, from training to landing to exploration to long night, an allusion to our small existence in the vast universe. (Figures 23-27)

Wall text for the *robotcowboy: Onward to Mars* show provided the basic "nutshell" idea: a one astronaut space rock opera about going to Mars. A large countdown clock ticked away the time for the theoretical blast-off of the show (Figure 28). In the end, this blast-off was delayed as the project was accepted for a grant as part of the Community Supported Art series at the New Hazlett Theater in Pittsburgh. [15]

In all, the *Onward to Mars* exhibition was designed to showcase the MDRS and the experience of living and exploring another world as well as promote the work this research was directly informing, *robotcowboy: Onward to Mars*. For me, the 5 photo prints were the most important aspect of the presentation as they contrast our expectation of what a mission to Mars **should** be with what the day-to-day realities of such an endeavor might be: the noble goal versus the fact that astronauts wear diapers on space walks. As with other aspects of my work, it is this tension between the utopian ideal and our "squishy existence" that I find most interesting.

CONCLUSIONS

I applied to the Mars Desert Research Station, an analog simulation of Mars exploration in Utah, in order to get a unique perspective that I could use to develop my live show, *robotcowboy: Onward to Mars*. Through this experience and the reflection brought from compiling my notes, photos, and reports into the *Heading to Mars* book, the show now contains insight and material I would never have come up with via second-hand research alone … and then some.

I learned that being an astronaut involves lots of paper work, that dehydrated vegetables taste best for cooking if you've soaked them in hot water for at least 15 minutes, and that a space suit feels normal after only a few days. I learned to love the white noise of my oxygen supply, taking minimal showers, and sharing a purpose with strangers. I became acutely aware that the world outside our tin can wants to kill us, that resources are limited, and that a cold night is not when the generator should fail. I learned that fear will always be present for life in space, but that we have the training and the technology to be prepared for it. I know the pioneer spirit and the quest for knowledge will push humanity beyond its current limitations.

Sol 14

> *Look up into the sky, we're looking back. Join us.*
>
> *Dan Wilcox, Journalist for Crew 119 of the Phoenix One, signing off. [10, p. 81]*

ACKNOWLEDGEMENTS

My wife Anika for all the encouragement as I embarked upon this project to Mars and my fellow crew members of the Phoenix One: John Reynolds, Paula Crock, Habib Palenfo, & Lisa Stewart. We met as strangers and left as explorers.

My time at the Mars Desert Research Station was supported by grants from the CMU College of Fine Arts & the CMU School of Art.

FIGURES

The Mars Desert Research Station HAB (Habitat), Greenhouse, and ATVs

A Mars Desert Research Station sim suit

robotcowboy: Cabled Madness performing at New Media Meeting 2009, Norrköping Sweden

Apollo 11 Astronaut Buzz Aldrin on the cover of the MIT Technology Review

Crew 119 mission patch by Habib Palenfo

Dan Wilcox @danomatika · 10 Dec 2012
#MDRS Sol 9: This is a sol of rest. There will be no fashion for the New Martians. Only utilitarian waffle thermals: flickr.com/photos/danomat…
View photo

Dan Wilcox @danomatika · 8 Dec 2012
#MDRS Sol 8: We, the New Martians, collected watercolor pigments from Martian soil. Coming soon, art on the Red Planet: flickr.com/photos/danomat…
View photo

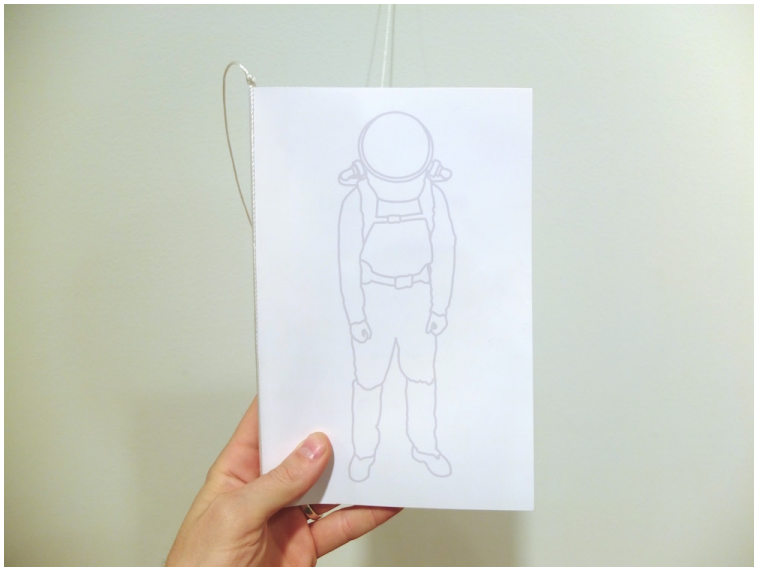
Dan Wilcox @danomatika · 7 Dec 2012
#MDRS Sol 7: Headed out today into the boulder fields East of Mars Base One. 20 mins of suit prep worth it every time: flickr.com/photos/danomat…
View photo

Dan Wilcox @danomatika · 7 Dec 2012
#MDRS Sol 6: Roamed far and wide today but sometimes the best things are in your own backyard, even on Mars: flickr.com/photos/danomat…
View photo

Dan Wilcox @danomatika · 6 Dec 2012
#MDRS Sol 5: 2 EVAs today, scouted roadbeds and interesting sites on ATVs, there is power in mapping our new world: flickr.com/photos/danomat…
View photo

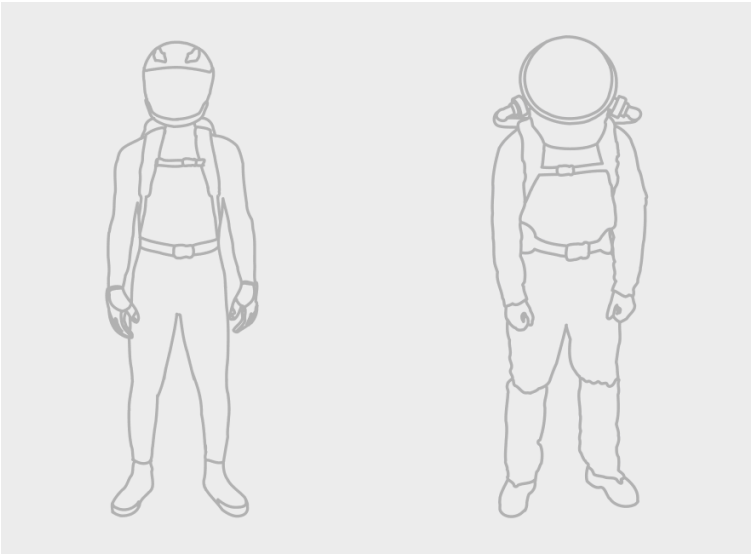
A selection of the author's tweets from the Mars Desert Research Station

One of the author's MDRS photos in BAUNETZ WOCHE #351



Heading to Mars 6x9 inch book

Heading to Mars in a print ad for the U Pitt Espresso Book Machine

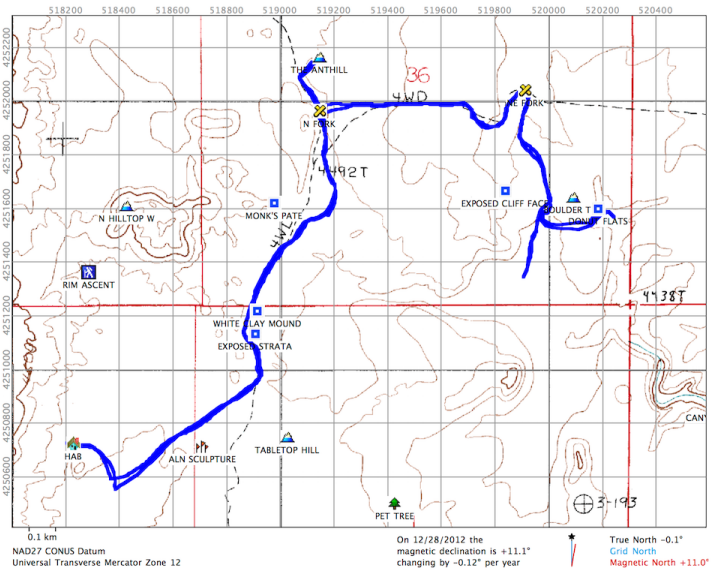


Heading to Mars cover design. Back (Left): MIT Bio-Suit inspired compression suit, Front (right): MDRS sim suit

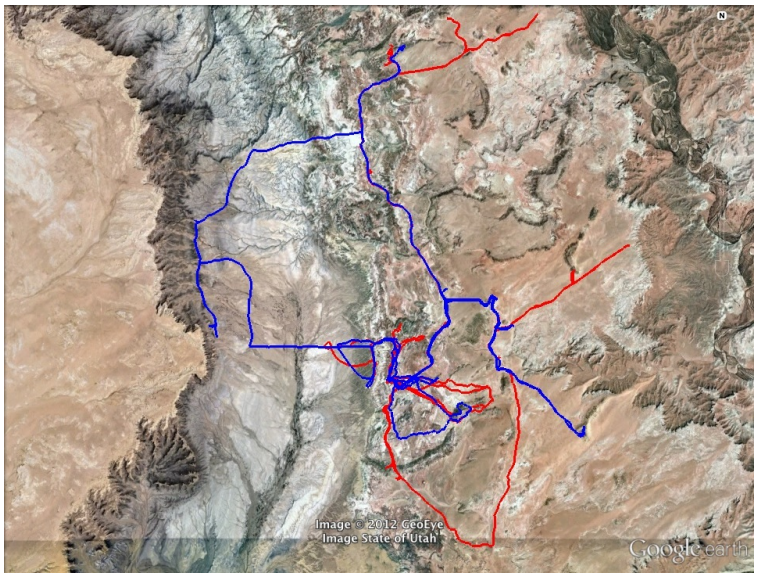
Author's movement & agility exercises on simulated Martian soil

The author with MDRS sim suit

Crew 119 EVA Sol 7A suit donning. Habib Palenfo assists Lisa Stewart (foreground)

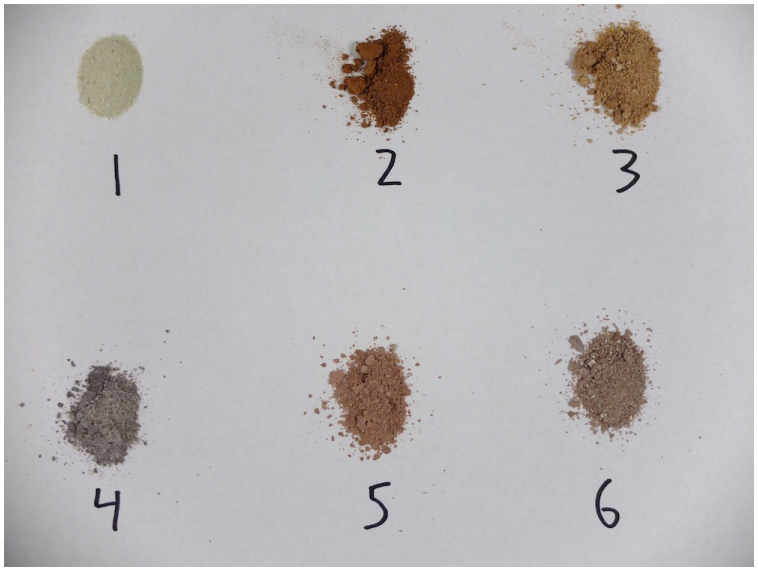


EVA Sol 5 B map by the author: an afternoon excursion for mapping possible future routes and points of interest (POIs)



All Crew 119 EVA tracks with red for morning and blue for afternoon

Colored pigment soil samples collected at the MDRS by the author. Each sample was documented with photos and a GPS coordinate.



Pigment sample color comparison from the separate Crew 119 *Colors of Mars* report

Enhanced color	Normal color
Sample 1 #BDB58E	#A4A087
Sample 2 #7B301C	#6B371C
Sample 3 #A25F39	#8A6746
Sample 4 #7F726B	#756B66
Sample 5 #8C4E3F	#7F5748
Sample 6 #7B564D	#796154
Sample 7 #87774D	#7D7665
Sample 8 #86855A	#797B68
Sample 9 #393429	#4A473F
Sample 10 #1A1613	#292621

Pigment samples were averaged for color and compiled into a color palette table. The left column has increased saturation for better contrast. These are essentially a varied sample of the "colors of Mars" at the MDRS.

Heading to Mars exhibition presentation. "Mars rock" in the foreground, MDRS field photos on left, book & pigment samples back left, *Onward to Mars* text and countdown clock in the background, and MDRS field video back right.

Pigment samples in their yellow-capped collection bottles

MDRS field video excerpts by Habib Palenfo

MDRS field photos presented in the Heading to Mars exhibition. Each photo is accompanied by a quote from the author's journal.

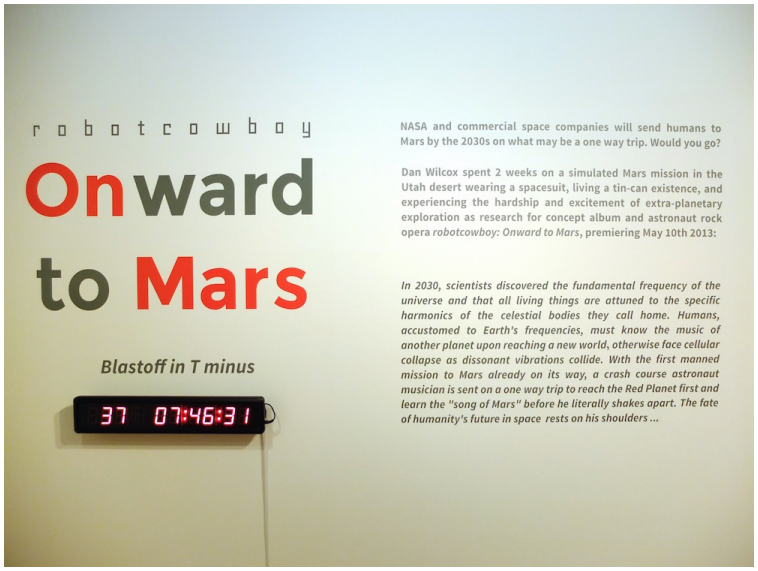
Exhibition wall photo 1: "Astronauts must prepare for momentous, symbolic actions."

Exhibition wall photo 2: “I forgot my towel. Douglas Adams would be disappointed.”

Exhibition wall photo 3: “Long EVAs require a urine collection kit.”

Exhibition wall photo 4: “Suit as second skin. Trying to blow dust off pen results in fogged helmet.”

Exhibition wall photo 5: “Early this morning the power went off. A stark reminder of how quickly we could disappear.”



Exhibition wall text & countdown clock for the upcoming *robotcowboy: Onward to Mars* show

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