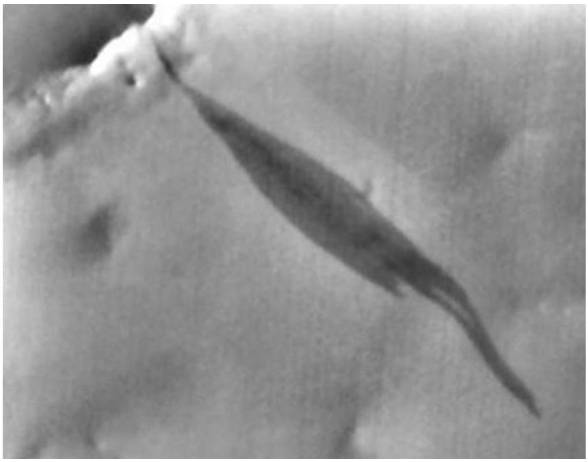
times less than the Earth's, any water exposed to the atmosphere will very quickly freeze or boil away into the air, making it surely impossible for any water-based life to survive under such conditions. However, I see no reason why NASA cannot land in these areas and explore the sites where recent water has been active in the Martian soil. An exploration of such locations would surely reveal some activity and remnants of that water's interaction with it, and perchance some microbial activity, or more.

So now to the crux of the matter…

Liquid Water on Mars

Are there any locations on Mars that clearly have present-day liquid water activity? Because if there are, then I believe NASA should boldly be targeting and heading straight for them - not avoiding and landing instead in barren areas with absolutely no water activity, as they have been doing. Well, here's one site they could have explored with their rovers (SM5):



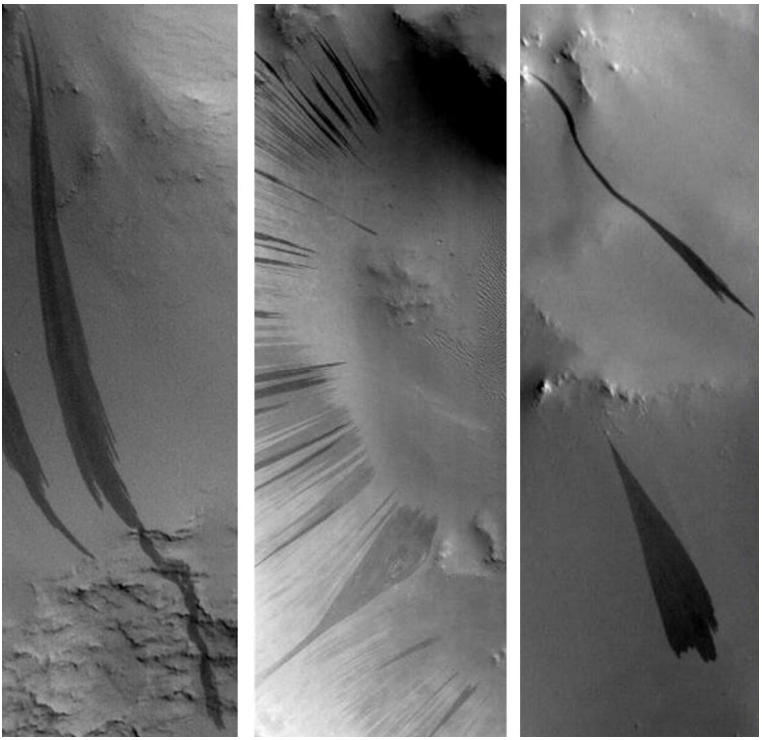
SM5. Water flow from a crater wall (2.5km) – MOC/MGS
Region: East Arabia, Jun 1998; found by Richard C Hoagland
Image credit: NASA/JPL/MSSS

This was the first evidence I had ever seen of the existence of liquid water on Mars. The photo was discovered by Richard C Hoagland during June 2000 while he was looking through the image data released by NASA from the orbiting camera onboard Mars Global Surveyor.[27] NASA had just put up for public viewing on the internet over 20,000 images taken of Mars between September 1997 and August 1999 *(I encourage you to go online and study this image for yourself, as with all the important images in this book. See image index)*.

Around this time, MSSS scientists Michael Malin and Ken Edgett had also given a news conference of their discovery of evidence for present-day water activity on Mars as they sought to explain Martian gulley features and dark flows from interior walls and peaks of impact craters. Their conclusions were that these features were best explained by sources of groundwater seepage and surface runoff, proposing a model which described a build-up of groundwater that was kept at bay by a barrier of ice but which periodically burst outwards in a slurry flow of water, ice, and sediment.[28]

Other scientists later observed that water flows emanating from isolated peaks and dune crests were likely to be from the melting of near-surface ice or snow originating from the atmosphere during high obliquity - when above-freezing temperatures can occur - or through the process of deliquescence when soil substances absorb water vapour from the air. NASA's generally preferred view, however, was to explain away these flows and stains as 'soil or dust displacements'.

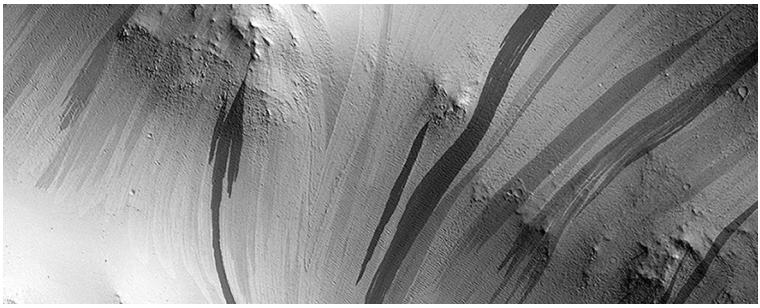
Although some of these dark flows will be soil slides, many are most certainly not. In the image shown (SM5), the way the dark stain fans and flows outwards surely displays the behaviour of a liquid - and that liquid is most likely to be water.



SM6, 7 & 8 Examples of "Dark flows" – MOC/MGS
Image credits: NASA/JPL/MSSS

In support of the water view, researcher Efrain Palermo also points out a clear correlation between the distribution of these flows, falling as they do within the warmer equatorial zone and the distribution of water as revealed by the *Mars Odyssey* spacecraft and its neutron detector and spectrometer instruments.[29]

There are literally hundreds of images of these stains and flows now recorded. Palermo and fellow researcher Jill England have now identified and catalogued many of them, presenting their research to the *National Space Society (NSS)* in Seattle, May 2002.[30]



SM9. "Dark flows" Arabia Terra Region – HiRISE/MRO
Image credit: NASA/JPL/University of Arizona

In the examples shown the liquid clearly originates from a small elevated point and then leaks downwards in a flow that would appear to soak the surface and then leave behind a dark stain. The stains themselves appear to remain for an extended period afterwards, although becoming lighter over time.

As any water in the flow would quickly freeze or boil-off due to the low atmospheric pressure on Mars there may be some residue in the liquid itself that causes the dark staining. Some researchers have suggested the activity of microorganisms. It may however simply be the result of the interaction between the liquid and the soil causing an unknown chemical reaction. As yet the answer is not clear.

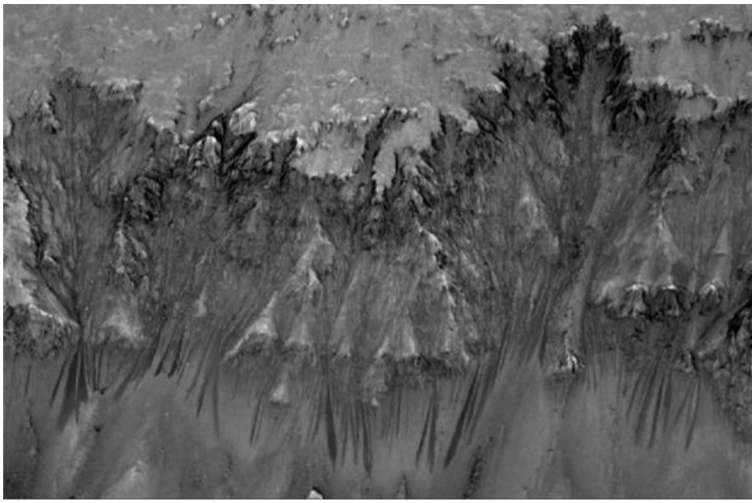
What is clear however is that surely there must be a cast-iron case for landing a spacecraft near to one of these flows, so as to discover something about this liquid. The potential for it harbouring some kind of life must surely be worth the journey. At the very least we will be in the act of studying current liquid water activity on Mars, not merely scooping up soil samples from a dried-up ancient floodplain, where water used to flow millions of years ago.

Every biologist will tell you this:

"In almost every environment on Earth where there is liquid water you will find microbial life."

This has to be the guiding principle for the scientific search for life on Mars, so why does NASA seem to be ignoring it?

It is true that many of these flows are in difficult places to reach - crater walls and steep slopes - but not all of them are. And even so, are you telling me that NASA can't think of some way to reach and extend out some technology to study that soil? If we know there is water there because our images show us there is and our scientists tell us there is, and our scientists also tell us that where we find water we almost always find life, then those are the places where we should be landing our spacecraft!

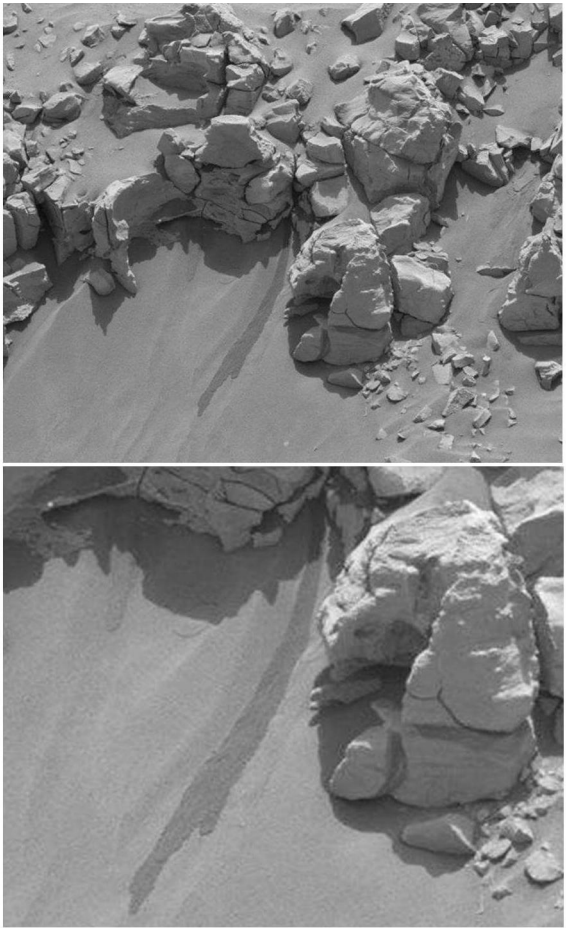


SM10. Spring & summer flows, Newton Crater – HiRISE/MRO

Image credit: NASA/JPL-Caltech/University of Arizona

Shane Byrne, assistant professor at the Department of Planetary Sciences, University of Arizona said that a lander would be able to positively identify the existence of

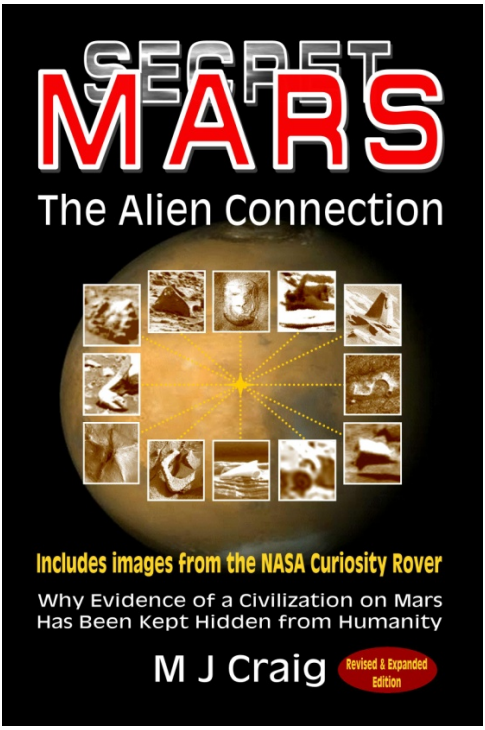
liquid water and that such a mission might also be able to hunt for signs of simple life forms.[31]



SM11. Liquid water flow in Gale Crater (15cm) – Curiosity (The rover drove right on by . . . not a whisper from NASA)
Region: Gale Crater, Sol 707, Aug 2014; found by Gary Proffitt
Image credit: NASA/JPL-Caltech/MSSS

Even the Curiosity rover curiously ignored a clear sign of water on its journey to Mount Sharp (SM11). It drove right past the obvious and unmistakable mark of liquid saturated soil, probably brine. This was a downhill flow

- End of Sample –



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