



## NRC Publications Archive Archives des publications du CNRC

### **Mars, the wet planet** Tapping, Ken

This publication could be one of several versions: author's original, accepted manuscript or the publisher's version. / La version de cette publication peut être l'une des suivantes : la version prépublication de l'auteur, la version acceptée du manuscrit ou la version de l'éditeur.  
For the publisher's version, please access the DOI link below. / Pour consulter la version de l'éditeur, utilisez le lien DOI ci-dessous.

#### **Publisher's version / Version de l'éditeur:**

<https://doi.org/10.4224/23003252>

*Skygazing: Astronomy through the seasons, 2018-04-10*

#### **NRC Publications Record / Notice d'Archives des publications de CNRC:**

<https://nrc-publications.canada.ca/eng/view/object/?id=dd165355-9ef7-47a9-86a0-99f585e6ec4c>

<https://publications-cnrc.canada.ca/fra/voir/objet/?id=dd165355-9ef7-47a9-86a0-99f585e6ec4c>

Access and use of this website and the material on it are subject to the Terms and Conditions set forth at

<https://nrc-publications.canada.ca/eng/copyright>

READ THESE TERMS AND CONDITIONS CAREFULLY BEFORE USING THIS WEBSITE.

L'accès à ce site Web et l'utilisation de son contenu sont assujettis aux conditions présentées dans le site

<https://publications-cnrc.canada.ca/fra/droits>

LISEZ CES CONDITIONS ATTENTIVEMENT AVANT D'UTILISER CE SITE WEB.

**Questions?** Contact the NRC Publications Archive team at

PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca. If you wish to email the authors directly, please see the first page of the publication for their contact information.

**Vous avez des questions?** Nous pouvons vous aider. Pour communiquer directement avec un auteur, consultez la première page de la revue dans laquelle son article a été publié afin de trouver ses coordonnées. Si vous n'arrivez pas à les repérer, communiquez avec nous à PublicationsArchive-ArchivesPublications@nrc-cnrc.gc.ca.



## MARS, THE WET PLANET

Ken Tapping, 10<sup>th</sup> April, 2018

Nearly thirty years ago a colleague astronomer at the National Research Council was determined to detect water on Mars. Water molecules can produce a characteristic radio signature with a wavelength of about 1.35 cm. He searched for these radio emissions using one of the largest radio telescopes in North America, the NRC's 46 metre radio telescope at the Algonquin Radio Observatory. If there was a significant amount of water vapour in the Martian atmosphere, it should have been detectable. None was found.

Widespread scientific opinion at the time was that Mars is almost completely dry, with its polar ice caps made of frozen carbon dioxide rather than frozen water. However, despite this, we really wanted to find water on the Red Planet. It would increase the likelihood of living creatures and would make it easier for us to more easily live there. Apart from using water to drink and to grow things, we can, if we have a good supply of electricity, break water down into hydrogen and oxygen. We can breathe the oxygen, making us less dependent on supplies from Earth.

Our first strong evidence of water on Mars came in the late 1970's, with the two Viking space missions. Each mission had two parts, an orbiter which would survey Mars from above, and a lander. The orbiters showed dried riverbeds, dry lakes and a host of the erosion and deposition features we associate with flowing water. At some point in its history, Mars was a wet planet. The landers saw barren desert, but with a frosting of water ice forming on the rocks during the cold Martian nights and evaporating in the sunlight. Subsequent orbiters, landers and rovers found copious and conclusive evidence that billions of years ago Mars was a very wet world. We now know a lot of that water is still around. When various Mars rovers drilled into or scraped the ground, they found a thick layer of ice beneath. They also found large deposits of minerals that require water to form. However, is that water

permanently sequestered underground or is it actually contributing to Martian processes today?

The current atmospheric pressure on the surface of Mars is about 0.5% of the pressure at the surface of Earth. The thin atmosphere and the low Martian temperatures mean liquid water cannot exist for long on the Red Planet's surface. It has to either freeze or evaporate. However, orbiting spacecraft are detecting short-lived water flows on hillsides and slopes, where the ice layer gets near to or reaches the surface. The Sun warms the ground, so that some of the buried ice melts. The water then flows down the slope as a muddy slurry, until the water evaporates or freezes. There are living creatures on Earth, ranging from bacteria to crustaceans, that lie dormant in dried up pools and frozen soils for years, decades or longer, until some liquid water appears. Then they become active, grow and breed until the water evaporates or freezes, when they go dormant again. It is not inconceivable on those sun-warmed slopes on Mars, where soils get warm enough to melt the ice, that there could be a brief explosion of life, followed by a long period of dormancy.

The action of solar ultraviolet radiation on the minerals on the Martian surface has led to the formation of perchlorates and other highly reactive chemicals not present on Earth. These are toxic to Earthly life forms, but a good source of energy for any living creatures evolved to use them. On Earth there are creatures living in environments too extreme for most living things. We cannot jump to conclusions about Mars; we need to go and look.

Venus is becoming more visible in the after-sunset glow, as a bright, starlike object. In the early hours Jupiter lies in the southern sky with Mars and Saturn to its left. Saturn is a golden colour and Mars is reddish. The Moon will be New on the 15<sup>th</sup>.

**Ken Tapping is an astronomer with the National Research Council's Dominion Radio Astrophysical Observatory, Penticton, BC, V2A 6J9.**

**Tel (250) 497-2300, Fax (250) 497-2355**

**E-mail: [ken.tapping@nrc-cnrc.gc.ca](mailto:ken.tapping@nrc-cnrc.gc.ca)**

