



NRC Publications Archive Archives des publications du CNRC

Life on Jupiter 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/10.4224/23000146>

Skygazing: Astronomy through the seasons, 2014-04-01

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

<https://nrc-publications.canada.ca/eng/view/object/?id=c06db271-420d-4b77-ab25-bb13ecc06485>

<https://publications-cnrc.canada.ca/fra/voir/objet/?id=c06db271-420d-4b77-ab25-bb13ecc06485>

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.



LIFE ON JUPITER?

Ken Tapping, 1st April, 2014

These evenings Jupiter is the brightest thing in the sky after the Sun and Moon. It is that very bright, star-like object visible high overhead when it gets dark and sinking westward overnight. A small telescope will reveal a tan-coloured disc crossed by darker belts, and up to four faint “stars” in line with the planet and changing position from night to night. These are the planet’s four largest moons: Io, Europa, Ganymede and Callisto.

Jupiter is a very different world from ours. It is the fifth planet out from the Sun (we live on the third) and lies over five times further from the Sun. It therefore gets only about 4% of the solar energy per square metre that we receive. It is cold. The planet is large: 143,000 km in diameter compared with Earth’s diameter of just under 12,800. So Jupiter’s volume is about 1400 times the Earth’s. However, it is only 318 times more massive. Its average density is only 1.3 compared with the Earth’s 5.5. Most rocks in the Earth’s crust have a density in the region of 2.5, so Jupiter must be mostly something less dense than rock. It is believed that Jupiter is mostly gas – a mixture of hydrogen, ammonia, methane and a host of various organic compounds. It is a member of the class of planets known as gas giants – worlds that are mostly gas, with a solid body somewhere deep in the middle. Jupiter does not seem a good place to seek “life as we know it”. For example, there is not much of a surface to run around on. However, Jupiter might not be a write-off for life. In his series “Cosmos”, Carl Sagan discussed the possibility, and science fiction writers such as Arthur C. Clarke wrote about living creatures in Jupiter’s atmosphere. Actually that does not sound unreasonable when we look at the issue in detail.

The dark clouds of gas and dust in space are loaded with a cocktail of organic chemicals. Laboratory experiments have been conducted where this gas cocktail was subjected to electric discharges. The result was a goop that transitioned through reds and browns to black, and

when this goop was analysed, it was found to contain amino acids, which are the building blocks for proteins. These are the foundations for life as we know it. We believe the atmospheres of young planets would often contain this mixture, and lightning storms would do the rest. It is interesting that all the colours that goop turned can be seen in the cloud belts in Jupiter’s atmosphere.

Both Carl Sagan and Arthur C. Clarke imagined great gas-bag creatures floating in Jupiter’s atmosphere, feeding on the organic chemicals, and other, more mobile creatures feeding on them. There are certainly plenty of food chemicals and floating around seems a benign way to live. However, things are a little more complicated than that. Jupiter is a lot larger than Earth, and it rotates much faster. A day on Jupiter is about ten hours, which means whereas a point on the Earth’s equator is moving eastwards at about 1700 km/h, a point on Jupiter’s equator is moving at around 45,000 km/h. The speed difference between the poles (0 km/h) and the equator drives really strong weather patterns, and draws the clouds out into belts around the planet. There are lots of storms. Some, such as the large vortex known as the Great Red Spot, are big enough to drop the Earth into. There are places where any Jovians (Jupiter’s inhabitants), would stay away from. However, even here on Earth there are lots of places living creatures like us stay away from, such as volcanoes, the deep ocean and so on, yet our world is teeming with life, some of it living under conditions that would kill us very quickly, so we should not give up on the possibility of life on Jupiter, and need to keep watching for it.

Jupiter lies high in the south at nightfall and sets around 3:30am. Mars and Saturn rise around 9pm and midnight respectively. Venus lies low in the dawn twilight. Its brightness makes it fairly easy to spot. The Moon will reach First Quarter on the 6th.

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

