Cosmology/Astrophysics News

November 18, 2015

for Rose City Astronomers SIG

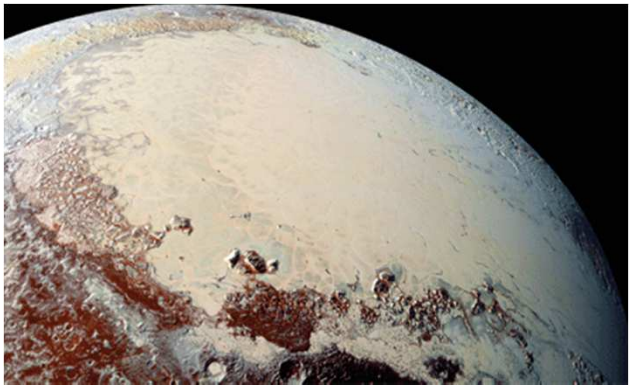
http://101iq.com/RCA

Nature – October 15, 2015

- **Two independent and primitive envelopes of the bilobate nucleus of comet 67P**
  - http://www.nature.com/nature/journal/v526/n7573/full/nature15511.html
  - The factors shaping cometary nuclei are still largely unknown, but could be the result of concurrent effects of evolutionary[1, 2] and primordial processes[3, 4]. The peculiar bilobed shape of comet 67P/Churyumov–Gerasimenko may be the result of the fusion of two objects that were once separate or the result of a localized excavation by outgassing at the interface between the two lobes[5]. Here we report that the comet's major lobe is enveloped by a nearly continuous set of strata, up to 650 metres thick, which are independent of an analogous stratified envelope on the minor lobe. Gravity vectors computed for the two lobes separately are closer to perpendicular to the strata than those calculated for the entire nucleus and adjacent to the neck separating the two lobes. Therefore comet 67P/Churyumov–Gerasimenko is an accreted body of two distinct objects with 'onion-like' stratification, which formed before they merged. **We conclude that gentle, low-velocity collisions occurred between two fully formed kilometre-sized cometesimals in the early stages of the Solar System.** The notable structural similarities between the two lobes of comet 67P/Churyumov–Gerasimenko indicate that the early-forming cometesimals experienced similar primordial stratified accretion, even though they formed independently.

Science – October 16, 2015

- **Late harvest from Pluto reveals a complex world**
  - https://www.sciencemag.org/content/350/6258/260.summary
  - http://dx.doi.org/10.1126/science.aad1815
  - NASA's New Horizons team, which in July sent a spacecraft past Pluto, publishes their first results this week. They describe features on Pluto's surface and in its atmosphere, such as a crust of water ice veneered with other frozen chemicals, a region of smooth, strangely youthful terrain, and a hazy atmosphere that has so far withstood an intensifying cold but is expected to freeze solid in the coming years. As more data come down from the spacecraft, the team has continued to find surprising features, such as water-ice mountains that may in fact be floating icebergs, and a perplexing "snakeskin" terrain of icy blades hundreds of meters high. The team is now preparing to steer the spacecraft to its next stop on its long journey: 2014 MU69, a Kuiper Belt object less than 50 kilometers across that the probe should intersect on New Year's Day in 2019.



- **Comet Siding Spring, up close and personal**
  - https://www.sciencemag.org/content/350/6258/277.summary
  - On 19 October 2014, a comet from the very edge of our solar system flew extremely closely by our sister planet Mars. Using an international fleet of modern spacecraft orbiting above and roving on the surface of the planet, scientists found that the comet consists of a kilometer-sized dirty iceball emitting gas and dust from numerous jets. The comet survived its extremely close passage by Mars without much change. It did, however, dump appreciable amounts of material into the martian atmosphere, and the effects from this material lingered for days. These observations of a comet from the surface and sky of another planet herald an era of solar system study based on multiple observations from stations throughout the solar system.

Nature – October 22, 2015

- Flows of X-ray gas reveal the disruption of a star by a massive black hole
  - http://arxiv.org/abs/1510.06348
- A disintegrating minor planet transiting a white dwarf
  - http://www.nature.com/nature/journal/v526/n7574/full/nature15527.html

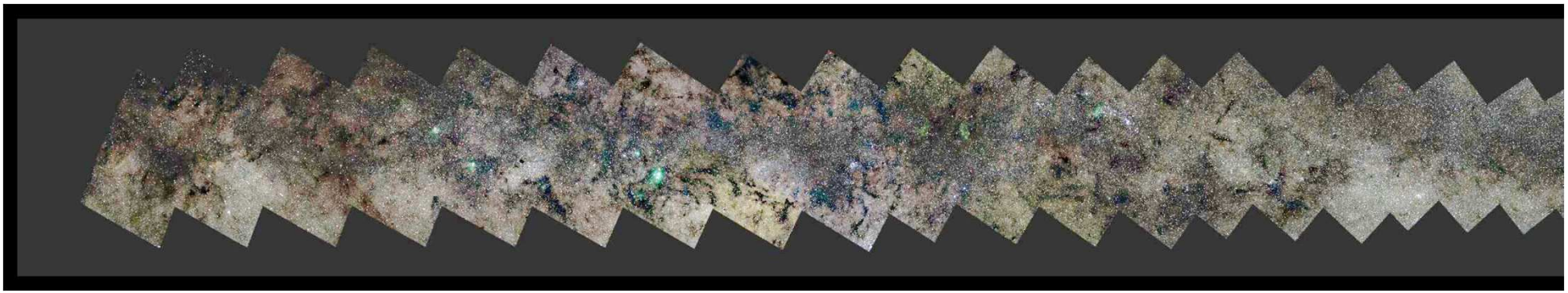
Science – October 23, 2015

- Asteroseismology can reveal strong internal magnetic fields in red giant stars
  - http://arxiv.org/abs/1510.06960
  - Internal stellar magnetic fields are inaccessible to direct observations and little is known about their amplitude, geometry and evolution. We demonstrate that strong magnetic fields in the cores of red giant stars can be identified with asteroseismology. The fields can manifest themselves via depressed dipole stellar oscillation modes, which arises from a magnetic greenhouse effect that scatters and traps oscillation mode energy within the core of the star. The Kepler satellite has observed a few dozen red giants with depressed dipole modes which we interpret as stars with strongly magnetized cores. We find field strengths larger than ∼10^5G may produce the observed depression, and in one case we infer a minimum core field strength of ≈10^7G.

Nature – October 29, 2015

- Abundant molecular oxygen in the coma of comet 67P/Churyumov-Gerasimenko
  - http://www.nature.com/nature/journal/v526/n7575/full/nature15707.html
  - The composition of the neutral gas comas of most comets is dominated by H_2O, CO and CO_2, typically comprising as much as 95 per cent of the total gas density[1]. In addition, cometary comas have been found to contain a rich array of other molecules, including sulfuric compounds and complex hydrocarbons. Molecular oxygen (O_2), however, despite its detection on other icy bodies such as the moons of Jupiter and Saturn[2, 3], has remained undetected in cometary comas. Here we report *in situ* measurement of O_2 in the coma of comet 67P/Churyumov–Gerasimenko, with local abundances ranging from one per cent to ten per cent relative to H_2O and with a mean value of 3.80 ± 0.85 per cent. Our observations indicate that the O_2/H_2O ratio is isotropic in the coma and does not change systematically with heliocentric distance. This suggests that primordial O_2 was incorporated into the nucleus during the comet's formation, which is unexpected given the low upper limits from remote sensing observations[4]. Current Solar System formation models do not predict conditions that would allow this to occur.

Science – October 30, 2015



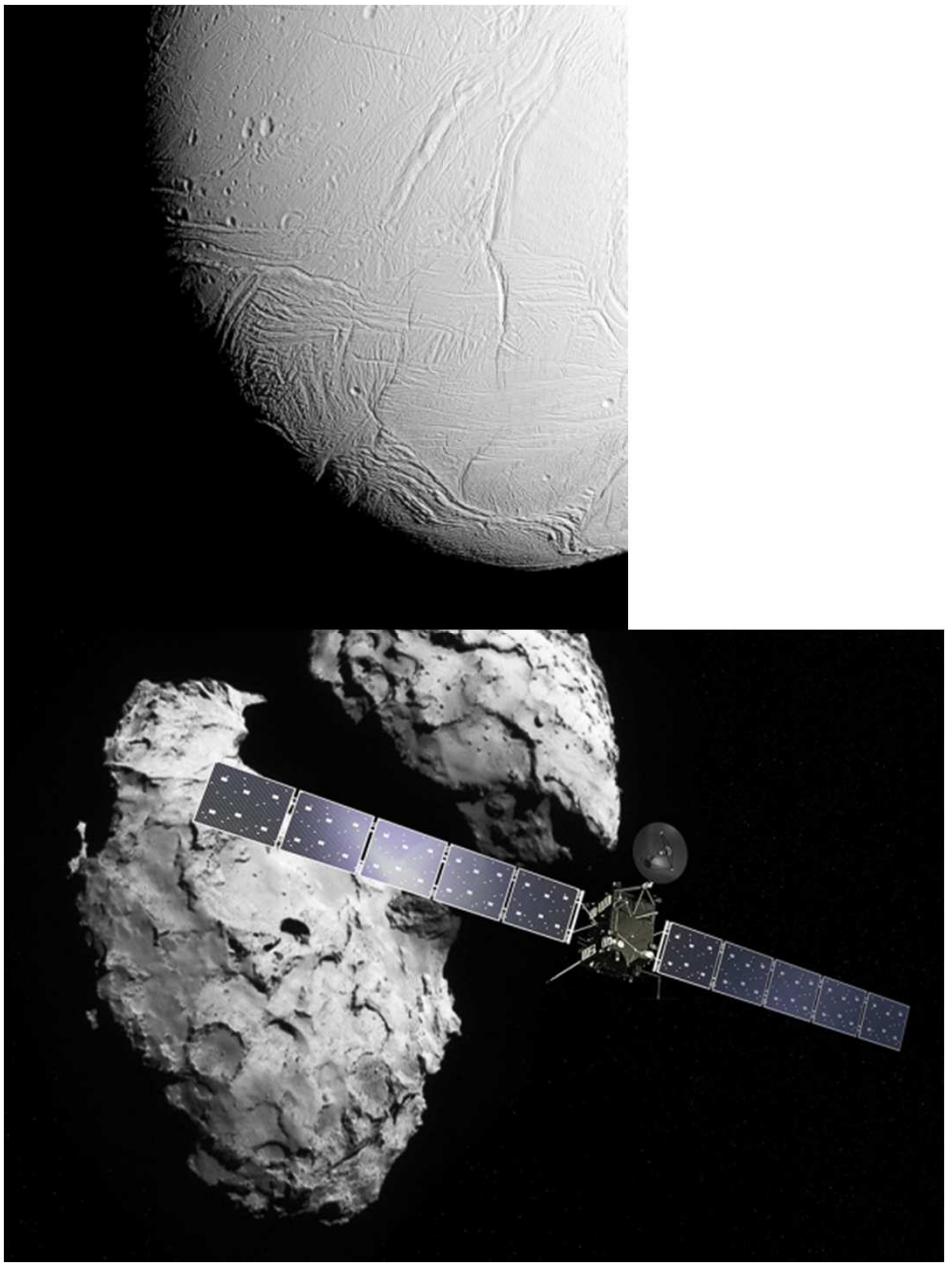
- A sweeping panorama of the Milky Way… go look:
  - http://astro.vm.rub.de/
- Europe's Mars rover to target ancient wetland
  - http://news.sciencemag.org/space/2015/10/europes-mars-rover-target-ancient-wetland

Scientific American – November 2015

- Gone without a Bang
  - Disappearing stars in nearby galexies may reveal the birth of black holes
  - http://arxiv.org/abs/1507.05823
- Seeing in the dark
  - Dark Energy survey aims to solve space is expanding faster…
  - http://www.scientificamerican.com/article/seeing-in-the-dark/

Nature – November 5, 2015

- Cassini dips into Enceladus's geysers
  - http://www.nature.com/news/the-week-in-science-30-october-5-november-2015-1.18711
- Historic Rosetta mission to end with "crash" into comet 67P to get super close-ups
  - http://www.nature.com/news/historic-rosetta-mission-to-end-with-crash-into-comet-1.18713



Science – November 6, 2015

- MAVEN explores the Martian upper atmosphere
  - https://www.sciencemag.org/content/350/6261/643.full
- MAVEN observations of the response of Mars to an interplanetary coronal mass ejection
  - https://www.sciencemag.org/content/350/6261/aad0210.abstract
- Discovery of diffuse aurora on Mars
  - https://www.sciencemag.org/content/350/6261/aad0313.abstract
- Early MAVEN Deep Dip campaign reveals thermosphere and ionosphere variability
  - https://www.sciencemag.org/content/350/6261/aad0459.abstract
- Dust observations at orbital altitudes surrounding Mars
  - https://www.sciencemag.org/content/350/6261/aad0398.abstract

Nature – November 12, 2015

- How Mars loses its atmosphere
  - http://www.nature.com/nature/journal/v527/n7577/full/527136a.html
  - Science articles:
    - http://doi.org/83k
    - http://doi.org/83m
    - http://doi.org/83p
- A small star with an Earth-like planet
  - http://www.nature.com/nature/journal/v527/n7577/full/527169a.html