Social Networking Planetary Science

How to Bring the Public Along on Suborbital Flights

THE PLANETARY SOCIETY

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http://planetary.org/blog

What Do We Mean by “The Public?”

- Different groups require different outreach.
- Three main groups:
  - The general public
    - A large group, but must be engaged at fifth grade level of traditional news media; getting attention is hard
  - K-12 classrooms
    - Another large group, but need special personnel to design outreach in line with standards & interact w/teachers
  - The "interested public"
    - A small group, but very easy (cheap) to engage

Why Engage the Interested Public?

- Interested public take less time & effort the general public and K-12 classrooms
  - Much less “translation” required
  - They can (and want to) digest raw products from missions and experiments
    - (You'd be pretty amazed by the minutiae that they're interested in)
- They are not well served by NASA's in-house PIO and EPO groups
  - They are EXCEEDINGLY GRATEFUL for your attention, and will tell you so, and will (if prodded) tell lawmakers so
- Not a dead end: They will multiply your EPO efforts
  - Through participation in online forums, blogs, Facebook, Twitter, and more traditional means, they perform translation function for a much wider community

Ways That the Interested Public Access Information

- In the past, mostly via special-interest publications
  - e.g. *Astronomy, Sky & Telescope, The Planetary Report*
  - A one-way avenue of communication
- Social networking has opened up opportunities
  - Online forums
    - allow interaction, sharing of resources and expertise
    - http://unmannedspaceflight.com
    - http://nasaspaceflight.com
  - Blogs by scientists and engineers
    - informal communication at higher technical level, and much more frequently, than press releases
    - New Horizons PI's Perspective, http://pluto.jhuapl.edu/overview/piPerspective.php
    - ESA mission blogs, e.g. http://webservices.esa.int/blog/category/7/56
  - Twitter is a marvelous method for following rapidly developing events like launches & suborbital flights

Case Study: The Mars Express Visual Monitoring Camera

- This is the best example I know of public outreach on a shoestring taking advantage of the interested public.
- Background:
  - Mars Express arrived at Mars on December 25, 2003
  - Like most ESA spacecraft, it carries an engineering camera called VMC
    - Low-powered, self-contained, low-mass; basically, a Webcam in space
  - Was used to watch Beagle 2 depart and then not again until 2007
  - Although very low in quality, it can get full-color, full-disk images of Mars, the only spacecraft that can currently do this
  - For more information:
    - http://esamultimedia.esa.int/multimedia/esoc/Mars_Webcam.pdf
    - http://esamultimedia.esa.int/multimedia/publications/ESA-Bulletin-139/pageflip.html

Case Study: The Mars Express Visual Monitoring Camera

- ESA's Operations Centre began a blog in August 2008 to invite the public to process VMC images
- They posted all VMC images
  - Posted in camera RAW and PNG format
  - In blog, suggested some activities to be done with them (cleaning, making animations)
  - These were exceedingly raw products, not even demosaicked
- They invited the public to turn these raw products into pretty pictures and promised to post nice ones on the blog
- This is all the incentive that the interested public needs

VMC

- 430 g, about 6x6x10 cm box
- Chip is 640 by 480 pixels, 8-bit depth
- Images are in color, using a Bayer filter

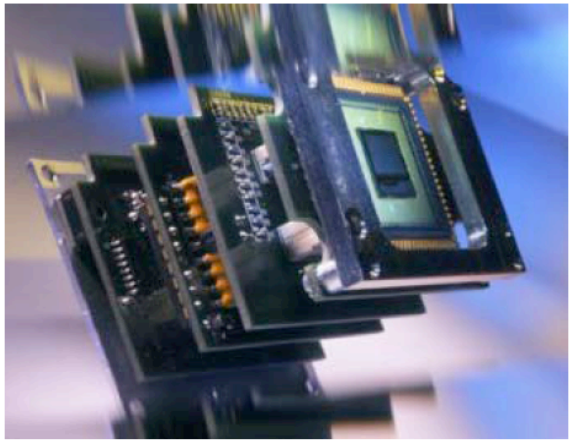
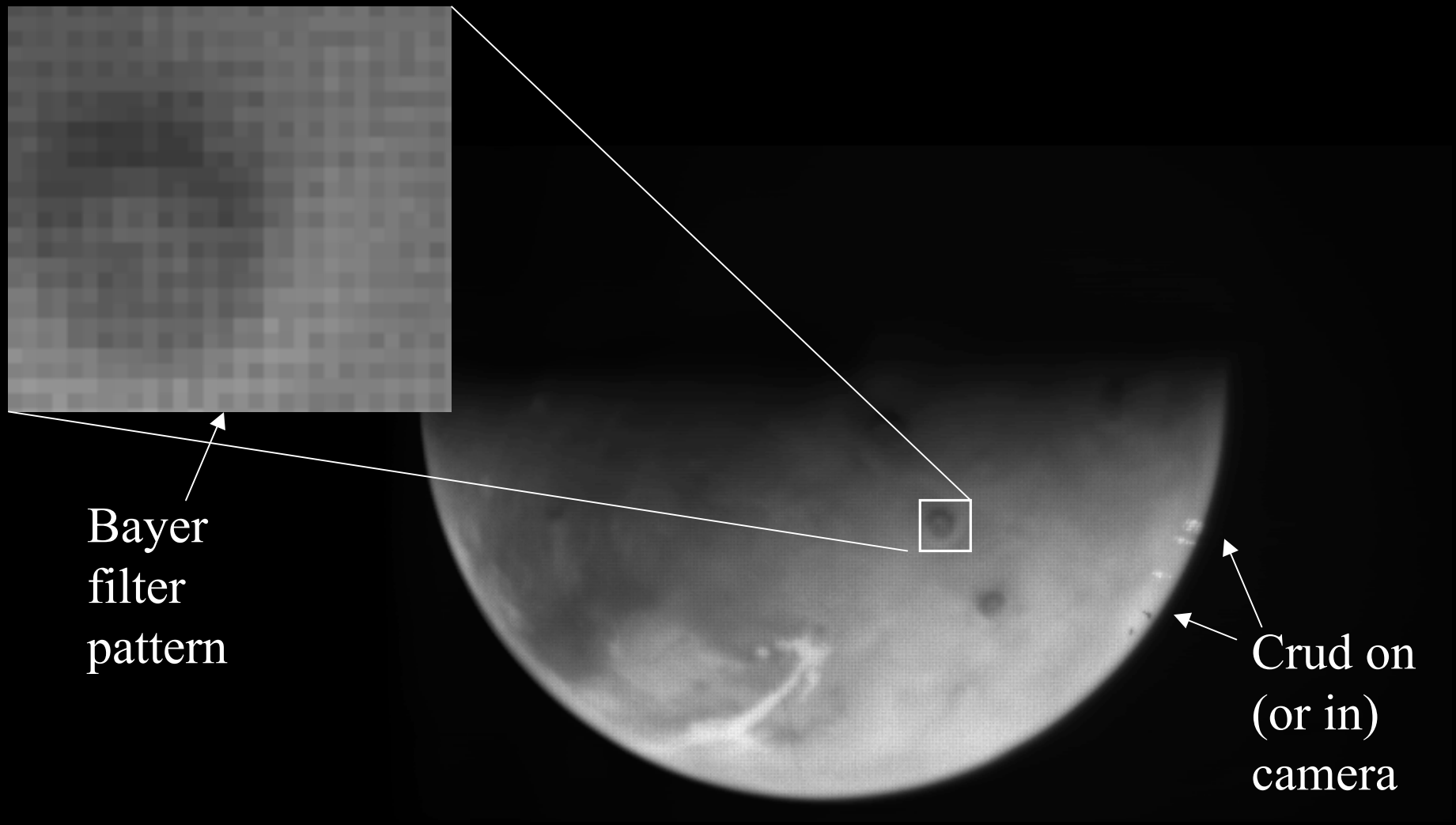


Figure 1. Photograph of the IRIS-1 System. *This shows the IRIS-1 "camera on a chip" system and power support internals of the VMC camera before application of the housing.*

Example Raw VMC image



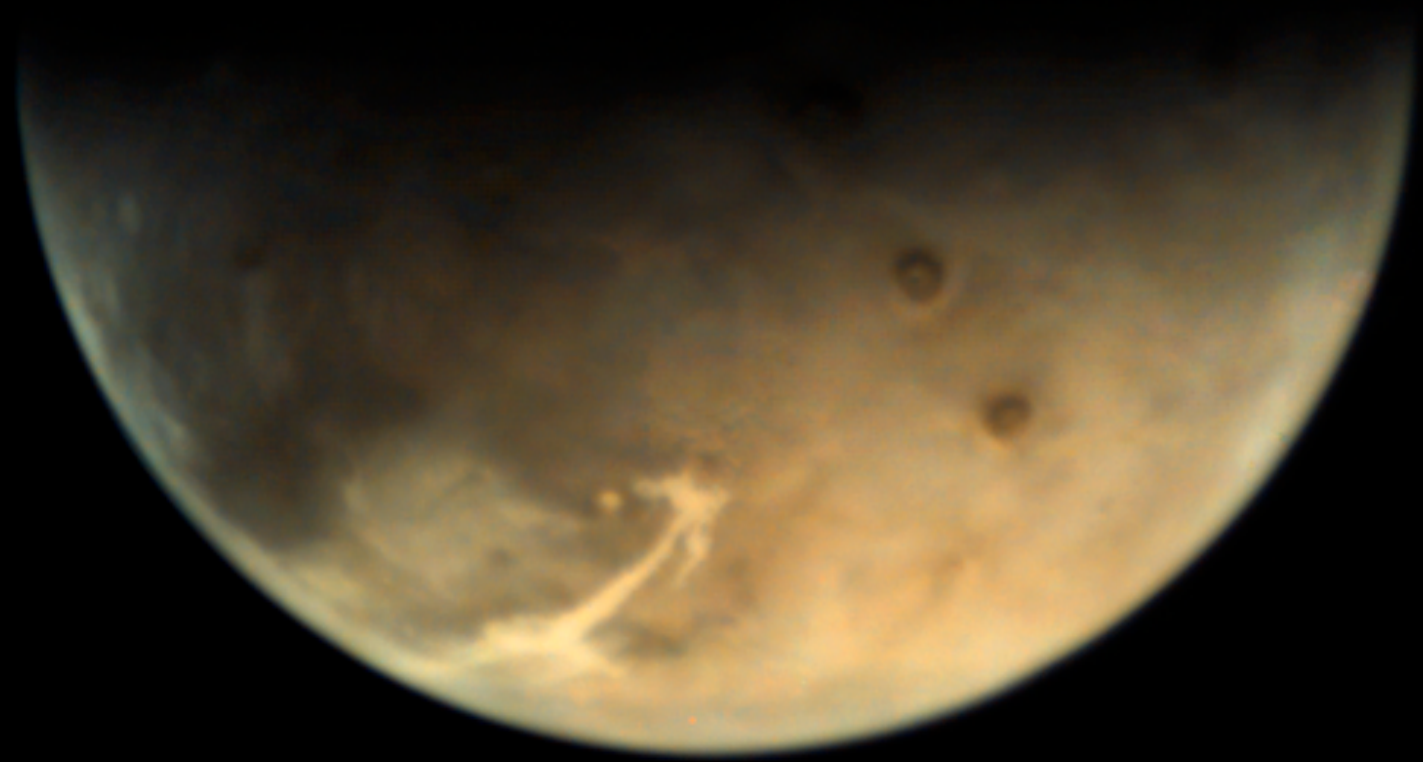
Case Study: The Mars Express Visual Monitoring Camera

- Within 24 hours(!!) of the launch of the blog, someone on the Internet had written command-line software to demosaic the raw images
  - vmc2rgb by Gordan Ugarkovic
  - http://www.unmannedspaceflight.com/index.php?showtopic=5415&view=findpost&p=124291
- Lesson: One especially skilled member of the public opened up VMC image processing to a huge group of less-skilled people
- Processed, pretty versions of images were available for posting to ESA's blog shortly after

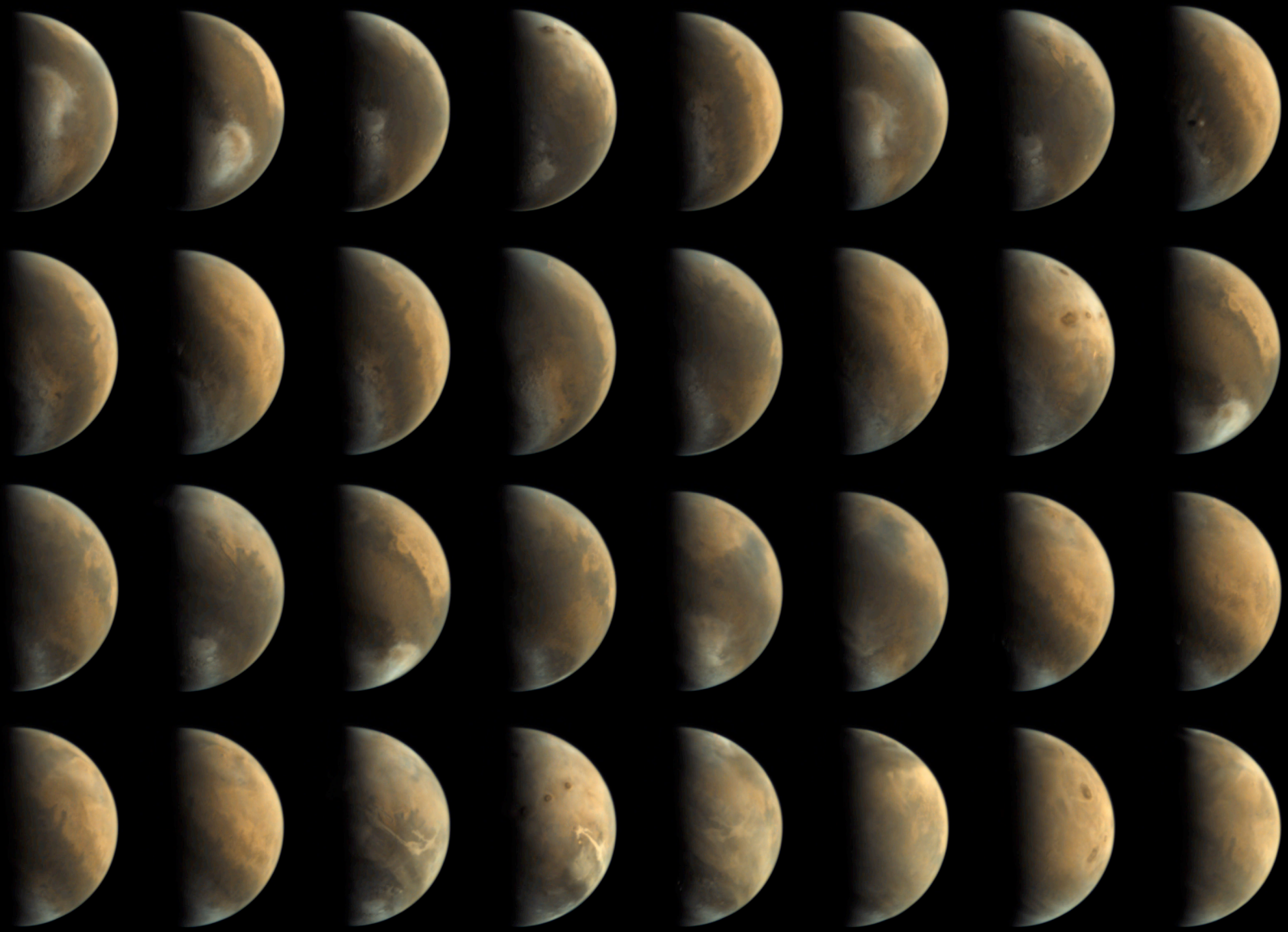
Case Study: The Mars Express Visual Monitoring Camera

- VMC staffer (Thomas Ormston) interacted with community via online forum UMSF
- With forum members doing most of the work and Ormston providing occasional answers to questions, VMC activities have become much more sophisticated and even fed back into mission science
  - high-altitude clouds have been discovered and tracked in VMC images, with UMSF users determining cloud heights and ground tracks
- VMC2RGB has been updated twice, most recently with flat fielding
  - Ormston takes VMC2RGB and other successful community-generated image processing tricks and puts them back into his automated PNG generator

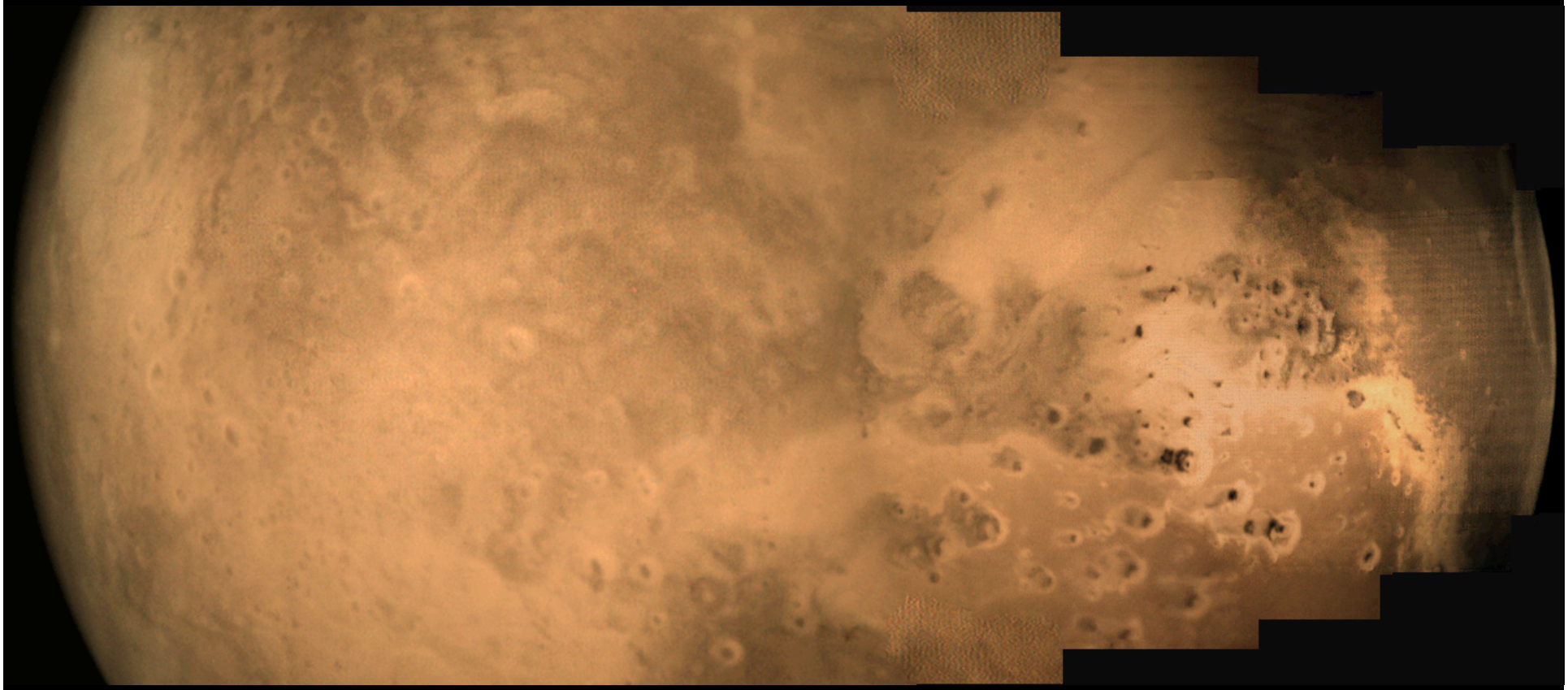
Current Quality of VMC Images



Community work with VMC images

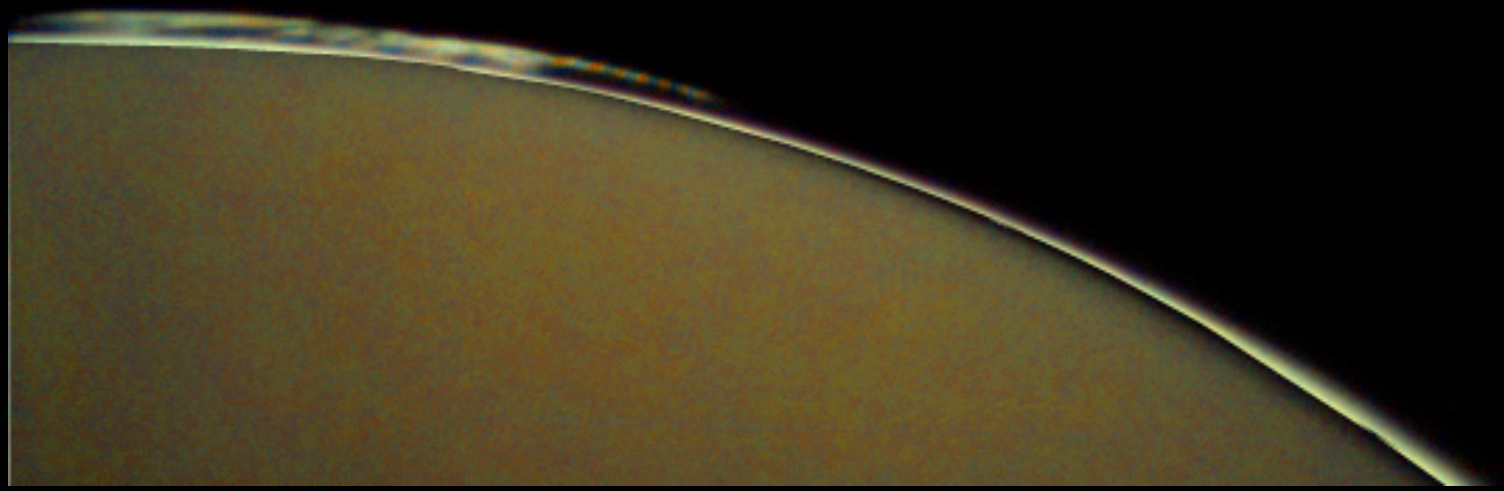


Community work with VMC images



ESA / Errol Bruce

Community work with VMC images



ESA / Mike Malaska

Other examples of successful engagement of (by) interested public

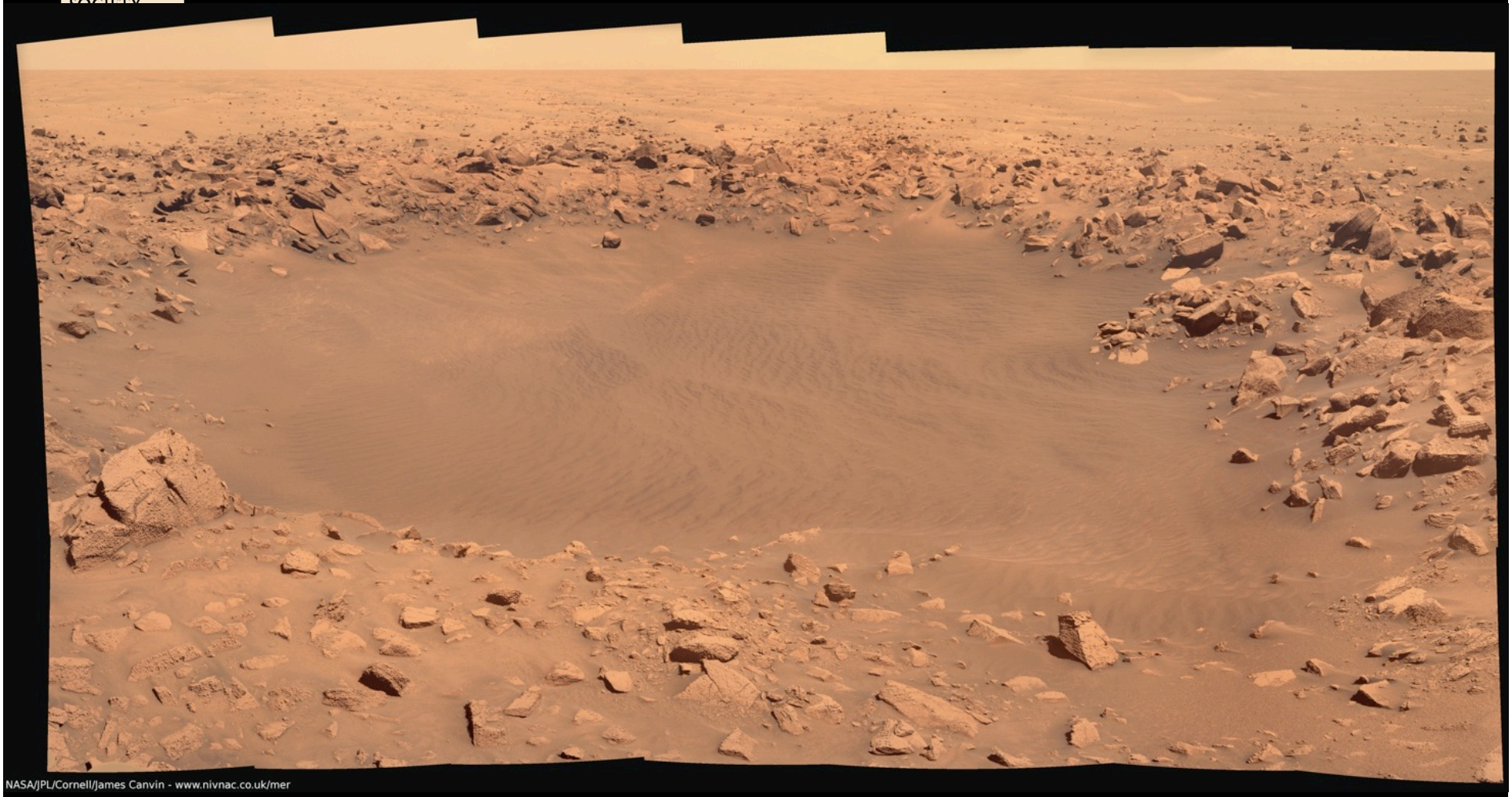
- Raw image websites of Mars Exploration Rovers and Cassini
  - Unlike with VMC, these missions have not posted results of amateur image processing publicly
  - However, amateur work has proven useful for internal planning and mission monitoring purposes
- New Horizons invited public to suggest "Kodak Moment" imaging opportunities
  - Short planning horizon prevented mission from doing this internally; public-generated Kodak Moments wound up being among the most popular images from Jupiter flyby
- Release of DEMs, other data has resulted in stunning visualizations for Mars
  - Examples: Doug Ellison's Pathfinder landing site http://www.youtube.com/watch?v=uE_Ih0hgnIw
  - "Mars3D"'s Gale crater http://www.youtube.com/watch?v=Cq0Z3cKJaGQ

Cassini image example

Mimas in color from February 13, 2010

NASA / JPL / SSI / Adam Hurcewicz

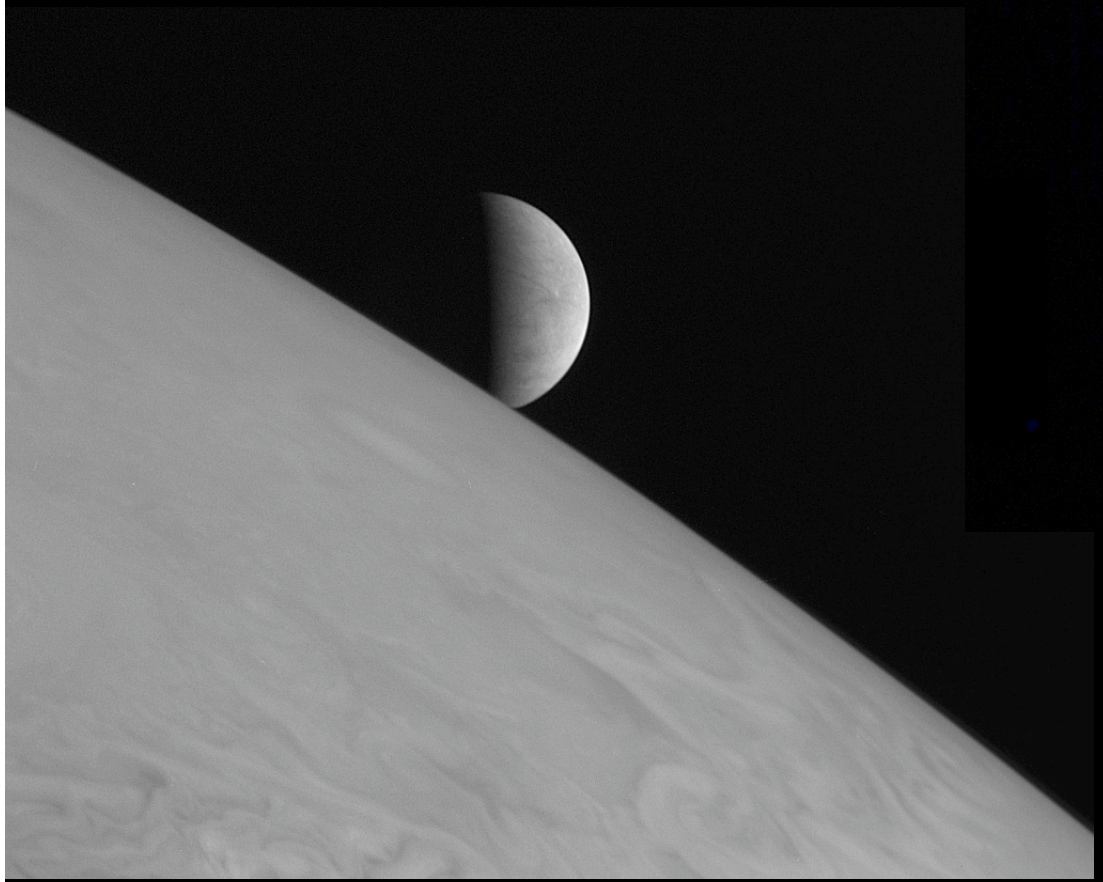
Rover image example



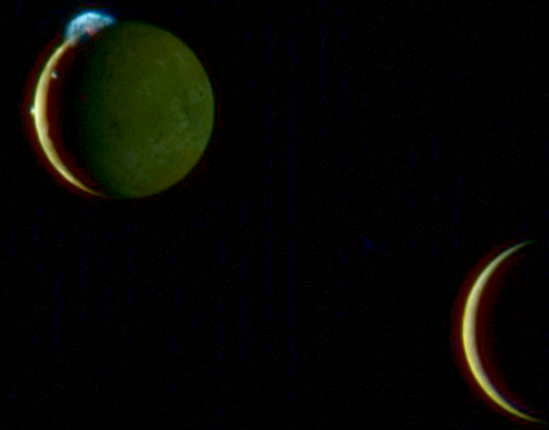
Opportunity at Concepcion

NASA / JPL / Cornell / James Canvin

New Horizons Kodak Moments



NASA / JHUAPL / SwRI



NASA / JHUAPL / SwRI /
Emily Lakdawalla

Example rover visualization

Spirit Stuck at Troy (inside earlier Navcam panorama)

NASA / JPL / Astro0

Some tips

- Post all ITAR-safe experiment documentation, conference abstracts & presentations, publications, & the like to your website
  - This lets the public answer their own questions using Google searches
  - Public can digest technical information into pretty web pages for you
    - Planning timelines turned into Web articles:
    - http://planetary.org/blog/article/00001670
    - http://planetary.org/explore/topics/cassini_huygens/tour.html
- Image data is the most engaging
  - But there are other sorts of data that are exciting if they are relatively accessible (e.g. accelerometer and other vertically profiled data from Huygens)

More tips

- If you are going to share images, PLEASE share metadata also
  - Publicly accessible databases of image metadata massively increase the sophistication of software that can be developed to digest and process images
  - This has been the main difference between public involvement in MER and Cassini image processing
- Invite selected members of the interested public to present at team meetings or to science conferences
  - You can learn from them what they are capable of producing, and make your EPO efforts more productive, while giving them a thrilling glimpse of the "inside" of space exploration

Conclusions

- Engaging the interested public allows you to multiply your EPO efforts into broader outreach
  - They can produce pretty pictures, translate technical documents, and even write software that makes your data more accessible
  - Many of these people serve as informal educators in their own communities, giving talks at schools and for community organizations, or disseminating information via blogs and Facebook
- All you need to do is provide Web access to technical information that you already produce
- With a small amount of active engagement (via blogs or forums) you can make the interested public feel as though they are active participants in your project -- and your project can benefit from their input and effort
- Go to http://planetary.org/blog for links to resources mentioned in this presentation