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Jay M. Pasachoff and William Sheehan

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taxpayer, thus ensuring a healthy level of funding for years to come.

Rob Johnson
(robjohnson@alphawaveresearch.com)
Alphawave Research
Jonesboro, Georgia

Did Lomonosov see the Venusian atmosphere?

Vladimir Shiltsev (PHYSICS TODAY, February 2012, page 40) properly credits Mikhail Lomonosov with a wide range of scientific achievements. But we have been corresponding with Shiltsev for some months about our realization[1] that Lomonosov did not discover the atmosphere of Venus. One of us (Pasachoff) analyzed spacecraft observations of the Cytherean atmosphere at the 2004 transit of Venus,[2] and we realized that what Lomonosov reported did not match actual atmospheric observations. NASA's *Transition Region and Coronal Explorer* spacecraft detected Venus's atmosphere for about 20 minutes as Venus's silhouette entered the Sun's limb, and again for the first 20 minutes of its exit from the solar disk. Lomonosov saw only a bulge of light—shown in figure 4a of Shiltsev's article—and a brief flash of light. We think that what he saw was an artifact of his relatively primitive and small telescope rather than the aureole that is sunlight refracted toward Earth by Venus's atmosphere. Our conclusions were reinforced by observations made during the 2012 transit of Venus.

Lomonosov wrote, quoted here from a translation made for us, "I watched with keen attention for the ingress of the trailing limb of Venus, which, it seemed, had not yet taken place, for there seemed to be a small segment not yet entered upon the Sun. However, there suddenly appeared between the trailing limb of Venus and the following [solar] limb a hair-thin luminous sliver. The time that separated the two appearances was not more than a second" (reference 1, page 5). But the actual aureole is produced by the refraction of sunlight in the Venusian atmosphere, and it is much too thin and faint for 18th-century observers to have seen it with the instruments available to them and from their low-altitude locations. Further, the bulge Lomonosov reported was probably an artifact that resulted from the blurring of the edge between Venus's dark disk and the bright solar limb on either side of it.

Like most scientists of his time, Lomonosov expected that all planets had life on them and therefore needed atmospheres to nurture that life, so he was inclined to report that he had discovered an atmosphere. Most of his article was philosophical in nature. The fact that he didn't actually have observations to back the correct conclusion does not diminish his achievement as one of the most important scientists of his time, and it would only dim his luster to credit him with discoveries that he didn't make.

References

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2. J. M. Pasachoff, G. Schneider, T. Widemann, *Astron. J.* **141**, 112 (2011).

Jay M. Pasachoff
(jay.m.pasachoff@williams.edu)
California Institute of Technology
Pasadena, California
William Sheehan
(sheehan41@charter.net)
Willmar, Minnesota

■ **Shiltsev replies:** The criticism of Jay Pasachoff and William Sheehan does not appear well founded. First, besides Mikhail Lomonosov, who was the first to recognize and explain the aureole around Venus, several other astronomers had seen it, too, during the 1761 and 1769 transits. The 18th-century images of the "Lomonosov arc" do not have the resolution of those taken nowadays from space satellites, but neither do most of the images that were taken by ground-based telescopes battling our atmosphere during the transits of the late 19th century, 2004, and 2012.

Also, I think the proportion of Lomonosov's paper that was devoted to the observations is perhaps a red herring. That he wrote 5 out of 16 pages placing his results in the intellectual context of his day is a testament to his abilities as a natural philosopher; the plurality of worlds was as hot a topic then as it is in our age of exoplanet research.

To address the skepticism, my colleagues and I experimentally replicated Lomonosov's discovery during the transit of Venus on 5–6 June 2012. A thin arc of light on that part of Venus off the Sun's disk during the ingress was successfully detected with original 18th-century Dollond achromatic refractors similar to the one deployed by Lomonosov and with his experimental techniques carefully emulated.[1] Simultaneous observations with high-quality modern doublet refractors revealed the aureole, too, and demonstrated that today's telescopes do not significantly outperform the earlier instruments.[2]

References

1. A. Koukarine et al., http://arxiv.org/abs/1208.5286.
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Vladimir Shiltsev
(shiltsev@fnal.gov)
Fermilab
Batavia, Illinois

Let's not call it the 'God particle'

Calling the Higgs boson the "God particle" is a mistake that we need to avoid.

Science is under serious and increasingly successful attack in the US by religious extremists who are concerned mainly with the teaching of biological evolution in public schools but are also generally anti-science and anti-intellectual. The majority of Americans have some religious beliefs that are important to them. I have been speaking to various churches, social clubs, and other groups, trying to explain to them what science is about; why science, correctly understood, does not threaten most people's religions; and why we can't afford to teach anything but the best science we know in our schools. I'm not trying to convert extremists. I'm trying to arm reasonable, mostly intelligent but uninformed people against simplistic arguments like "It's only a theory" or "Why not teach all sides?" They listen to me because I respect their religious beliefs even though I don't share them. They tune out scientists who offend their religious sensitivities.

We need such people to be our allies. Offending them by using "God" flippantly is just throwing gasoline on a fire. It's encouraging a fight we cannot win, and we should stop doing it.

Murray Peshkin
(peshkin@anl.gov)
Argonne, Illinois

Correction

July 2012, page 47—The sentence beginning four lines below equation 3 should read, "The so-called likelihood function $P(data|param)$ is, in fact, simply the probability of seeing the observed data if a specific parameter value is the true one." ■