www.astrosociety.org/uitc

No. 62 - Summer 2003

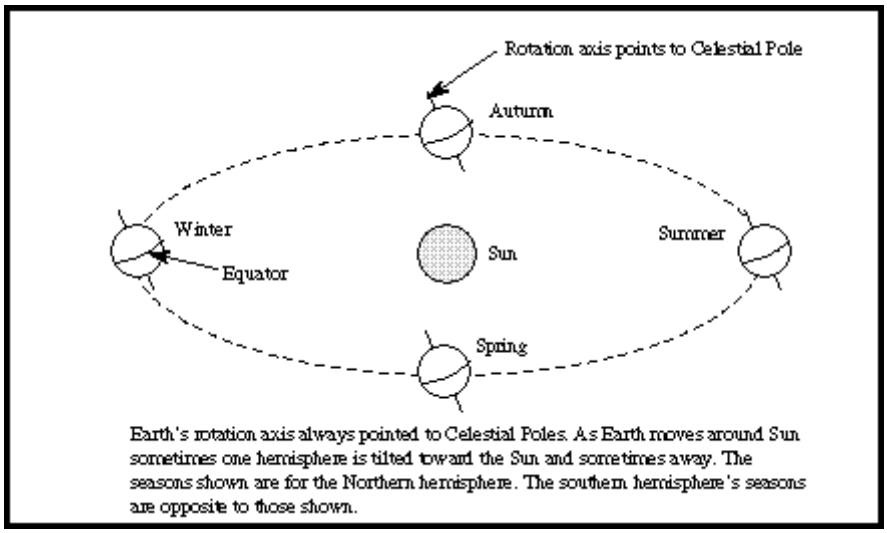
Egg Balancing at the Equinox: Good or Bad Astronomy?

by Phil Plait

Editor's Note: The changing of the seasons. We all experience them and some even look forward to them. Learning and teaching about the how's and why's of them, however, is another story, especially if you live somewhere like San Francisco. Summer is not a time of heat, but of long, cold, foggy days. The reasons for the seasons was tackled in newsletters number 29 and 30 but still many pesky misconceptions persist. One of the more amusing ones is the mysterious ability to balance eggs on end at the Vernal Equinox (curiously, no such claims are made at the Autumnal Equinox). In this issue, Phil Plait, an astronomer who has written a whole book on persistent and prevalent misconceptions and mangling of astronomy takes on this astronomical connection to egg balancing. Is the equinox a time of equality and balance, not just for the division of day and night, but for eggs, as well? Have fun with this issue and then have your students take on this bit of "Bad Astronomy" and debunk it for themselves.

Introduction

This has to be one of the silliest misconceptions around, and it never seems to die. Every year, without fail, some TV station broadcasts a news segment showing local school children standing eggs on end on the first day of spring. Usually, the newscaster will make some vague mention about how this works, but it is rarely specific, and never holds up to too much scrutiny. We'll talk about one typical reason given in a moment, but first, let's look at it from an astronomical angle: what is special about the Spring (also called the Vernal) Equinox that makes it different from any other time of the year?



The Reason for the Seasons

The Earth's spin axis is tilted with respect to its orbital plane. This is what causes the seasons. When the Earth's axis points towards the Sun, it is summer for that hemisphere. When the Earth's axis points away, you get winter. From the diagram above you can see that the north end of the Earth's axis never points directly at the Sun, but on the summer solstice it points as close as it can, and on the winter solstice as far as it can. (That diagram is taken from Nick Strobel's excellent Astronomy Notes website http://www.astronomynotes.com/nakedeye/s10.htm). Midway between these two times, in spring and autumn, the spin axis of the Earth points 90 degrees away from the Sun. Note that this happens twice a year, in spring and autumn. If you can stand an egg on its end on the Spring Equinox, surely you can on the Autumnal Equinox as well! Yet this always seems to get overlooked. That should be your first indication that something fishy is going on. Also note that the Vernal Equinox is actually heralding autumn in the southern hemisphere. Bad Reader Angela Alexander tells me that the egg myth is also around in Australia, although she admits she may have heard it on the web (which means it could have originated anywhere). Still, it's one more reason to doubt the "truth" behind the legend.

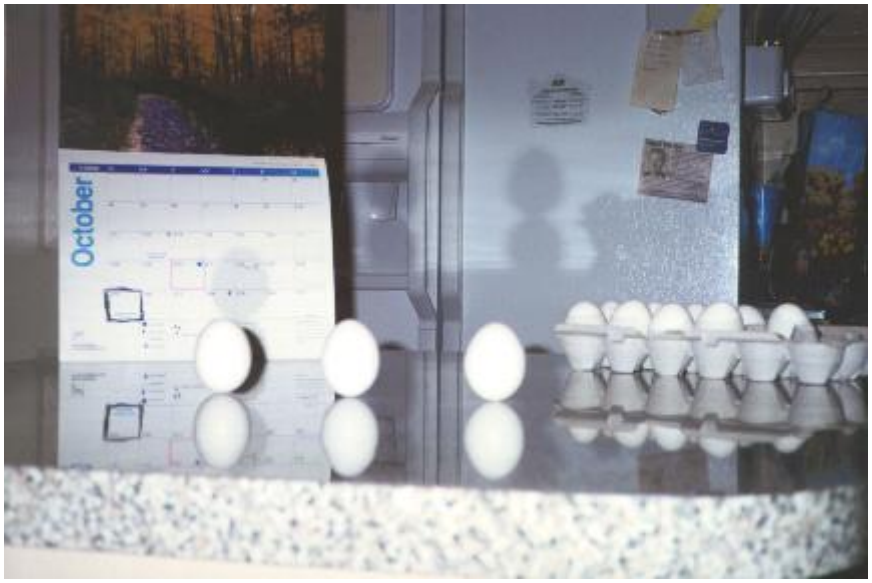
So on the first day of spring and autumn, the Earth's axis happens to be pointing perpendicularly to the direction of the Sun. Although it might seem like a special event, all it really means is that day and night have about the same length: 12 hours each, more or less. Otherwise, it has no real manifestations to us here on the surface; if you were locked in a windowless box (hmmm, sounds like my old office) you would have no way of knowing that it was the equinox. As far as gravity goes, there isn't anything special about this time.

I once heard a newscaster say that you can stand an egg on end during the Spring Equinox because the Sun's gravity "lines up with Earth's". This is just silly: draw a line between the center of the Earth and the Sun, and you'll see that at any time, someplace on the Earth is on that line! If there is any validity to this solar balance claim, then certainly it negates the Spring Equinox claim. I would hope our nation's television journalists would know better. I do a lot of hoping.

Combatting Bad Astronomy in Your Classroom

What I love about this example of Bad Astronomy is that you need not take my word on it. This is one you can prove for yourself!

At any day of the year, grab a carton of eggs and try to stand each one. Usually you cannot stand a raw egg because the inside of an egg is a very viscous (thick) liquid, and the yolk sits in this liquid. The yolk is usually a bit off-center and rides high in the egg, making it very difficult to balance. The egg falls over. However, with patience, you can usually make an egg stand up. It may take a lot of patience!



The pictures you see scattered around here were taken on October 25, 1998 (yes, that's me in that picture). Of course, I could be lying about the date, but again, you can prove this for yourself by trying to stand an egg on end on any random day. Go ahead and try it now! Whenever I buy eggs from the store I grab one or two from the carton and stand them up. It's fun. When the pictures here were taken in October of 1998, I was able to get three eggs standing pretty easily, then my wife helped me stand up five more!

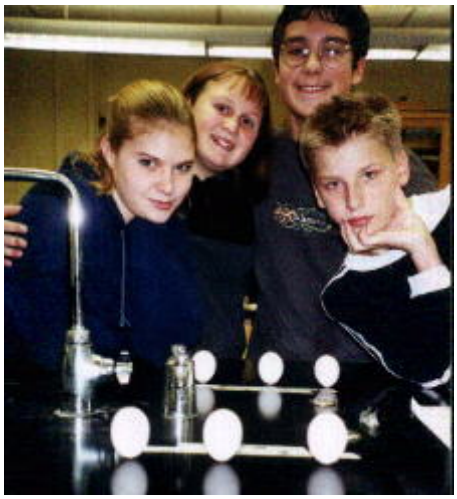
Egg Balancing at the Equinox: Good or Bad Astronomy?

What's really going on?

So the question remains: Why do eggs stand at all? I had a pretty good working theory about it. If you get an egg to stand up, leave it alone for a while to admire your hard won effort, then pick it up. Look at the bottom: there are tiny little bumps in the shell there, I'll wager. Those bumps are simply irregularities in the eggshell, and they act like little legs holding the egg up. That's what I figured makes the egg stand on end. It's not the vastness of space and the infinite grasp of gravity in balance; it's those stubby little bumps on the egg. I have found over and over again that smooth eggs are far more difficult to balance than rough ones.

I have also found that warm ones are easier to stand up as well, though I am not sure why. I originally thought that it might be because the liquid inside the egg thins out as it warms up, allowing the yolk to settle down farther. However, that turns out not to be the case. I chatted with Dr. David Swayne, who is a poultry veterinarian for the U.S. Department of Agriculture. He told me that the thickness of the albumen (the "white" part of the egg) does not depend on temperature. After all, the job of the albumen is to protect the yolk, and if it got thin when warm it wouldn't perform as well. So the mystery remains. I wonder: it takes time for an egg to warm up, and during that time I am trying to balance it. The more I try, the better I get! So I get better with time, and the egg warms with time. Maybe it's simply time that's important, and not temperature.

I mentioned above that I had a working theory about the bumps on the bottom of the egg acting as legs. The past tense is important! I recently received an email from Lisa Vincent, who teaches at the Mancelona Middle School in Mancelona, Michigan. She and her class decided to test the egg-myth for themselves, and had her students try it on October 16, 1999 (coincidentally, almost exactly a year after the images above were taken).



Not only did they get eggs to balance, but they got them to balance on their short ends! This is a feat I have never been able to reproduce. For proof, they sent me images of their eggs, which I present here. Note that the eggs are indeed standing on their short ends. Incidentally, Ms. Vincent told me the eggs remained standing for over a month. Usually a random vibration would knock an egg over, but in the image it looks to me like they were standing on a standard high school chemistry class work table and sink, which are designed to be very sturdy. That was a good choice!

The beauty of the Mancelona kids' work is that they showed me what science means: sometimes you have to abandon a theory when a better one comes along. I thought an egg could only balance on its fat end (the narrow end usually is much smoother, making it harder to balance), but they proved me wrong. Since I knew it could be done, I kept at it, and now I am happy (and oddly proud) to say that I have indeed managed to get an egg to stand on its narrow end.

Bottom line: if an egg stands on end, it would do it at any time, and not just at the equinox. The equinox has nothing to do with it. And here's a good rule: if you see it on your local news, ask yourself, did that make sense? Is there any way I can prove or disprove that myself? Sometimes it pays to question the national news as well.

Congratulations! Once you do this, you will be on the road to rational thinking. As Richard Feynman said, "Science is a way for us to not fool ourselves."

The origins of the myth

The egg standing myth is like an extremely contagious virus. It is everywhere, all over the world. It's easily transmitted; unlike the organic variety, this virus can spread infectiously through the web and television. And, like most viruses, its history is difficult to trace. I spent a long time on the web trying to nail down its origin, with no luck.

Then I tried the web search engine www.google.com. All the other search engines were no help when I searched on words like "egg standing equinox" (frustratingly, most returned my own webpage about it). Google however gave me a long list of sites, and in one I struck gold. At The Textbook League's website is an article by William J. Bennetta which referenced an article in the wonderfully rational magazine Skeptical Inquirer written by Martin Gardner. Gardner is a renowned skeptic, and I grew up reading his books on puzzles and brain teasers. It was quite a joy to find that he was the linchpin in my search.

As you may know, most urban legends in America like this one have origins that are lost in the murky history of repeated telling. It's usually impossible to trace the origin to even a specific century, let alone a date. However, in this case, we can find a traceable and very specific origin: Life magazine.

As reported by Gardner in the *Skeptical Inquirer* (May/June 1996, page 8), the legend was born with an article penned by Annalee Jacoby in the March 19, 1945 issue of Life magazine. Ms. Jacoby was on assignment in China at that time, when she witnessed a peculiar Chinese ritual. In China, the first day of spring is called Li Chun, and they reckon it to be roughly six weeks before the vernal equinox. As loyal Bad Astronomy readers already know, in most countries, the equinoxes and solstices do not mark the beginning of seasons; America is odd in that we say that Spring begins on the equinox. Since a season is three months long, these other countries believe the actual first day of spring is six weeks before the equinox.

According to Chinese legend, it is easier to stand an egg on end on what they call the first day of spring (which, remember, is in early February). The Chinese legend, unfortunately, has an uncertain origin, though it is propagated through old books about Chinese rituals. Ms. Jacoby was in the capital city of Chunking on Li Chun when a crowd of people came to balance eggs. It must have been quite a sight, and so she wrote about it for *Life*.

Evidently, the United Press picked up the story and promptly sent it out over the wire. At that moment, a legend was born.

What's funny about this is that Ms. Jacoby evidently reported that the event occurred on the first day of spring, but it was never said (or else it was conveniently forgotten) that the first day of spring in China is a month and half before the first day of spring as recognized by Americans! The legend now states that you can only stand an egg on end at the equinox, yet the legend started because the Chinese were standing them up six weeks earlier. Ironically, the very basis of this legend is wrong!

And yet the legend persists, and the virus infects more of the populace. The biggest blooming of the virus happened on March 20, 1983, when Donna Henes, a self-proclaimed "artist and ritual-maker", got a hundred people in New York City to publicly stand eggs up at the vernal equinox. This event was covered by the New Yorker magazine, and the article was published in the April 4, 1983 issue. At 11:39 p.m. (the exact time of the equinox), Ms. Henes stood an egg up and announced "Spring is here."

"Everyone in the crowd, us included, got busy balancing eggs," the New Yorker effused. "Honest to God, it works." The unnamed New Yorker reporter was not so convinced, however, as to believe the legend completely. They tested it themselves and failed to get an egg to stand up later that week. The reporter admits it may have been psychological. "The trouble may have been that we didn't want the egg to balance- that we wished to see Donna Henes to be proved right."

More irony can be found here: the reporter actually went out and asked several physicists about the legend. Not one could give an explanation as to why an egg would balance easier (or solely) on the equinox. Of course not: there is no reason!

And on it goes. A year doesn't go by that I don't see something on the news about the legend, with the newscasters claiming it as fact. Ms. Henes went on to more balancing rituals too. The year after the above demonstration, more than 5000 people showed up at the World Trade Center to participate in an egg balancing. Even the New York Times was duped; a few years later, in an editorial on March 19, 1988, the headline "It's Spring, Go Balance an Egg" appeared. Two days later, the Times ran a picture of people standing eggs up, again at the World Trade Center.

With such a source as the New York Times, one might think my own humble efforts are in vain. Maybe so, but I hope not. Every year my egg standing page gets hundreds and thousands of hits around the equinox, so the word is spreading that way at least. I've been quoted on the news about it, and I sometimes talk on the radio, too. I may be bucking the odds, but I can dream that someday this virus will be stamped out, and Good Astronomy will prevail.

Conclusions:

Bad Astronomy: Only on the day of the Vernal (spring) Equinox, can you stand a raw egg on its end.

Good Astronomy: If you can stand a raw egg on end, it has nothing to do with the Equinox.

The source of this article is: http://www.badastronomy.com/bad/index.html. Explore the entire site for more links on the subject and more debunking ideas that you can do in the classroom.

About the Author

Philip Plait works at the physics and astronomy department at Sonoma State University, part of the California State University system. He is currently working on a NASA-sponsored public outreach program for a satellite named GLAST (Gamma Ray Large Area Space Telescope). He received his PhD in astronomy at the University of Virginia in 1994. While there, the bug to teach basic astronomy to the public got a hold of him during Public Nights UVa at the campus run observatory. Before that, he was an avid amateur. "I had a 10" reflecting telescope for over 20 years (I bought it when I was 13 years old), and now here at Sonoma State I have access to a 14" and another 10", so I am still very much active in hands-on astronomy."