Tuesday, March 31, 2009

Astronomy in the News? Texas School Board removed "strengths and weaknesses" language from the curriculum guidelines.

Colbert Report

Pic of the Day - Tarantula Nebula, 30 Doradus, in the Large Magellanic Cloud, massive stars, more than 100 solar masses, winds, "bubbles"



International Year of Astroomy

> 24-Hour Webcast: Around the World in 80 Telescopes

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> In celebration of the International Year of Astronomy, observatories around
> the world will stage a 24-hour webcast April 3 (Universal Time) to show what
> happens in a night at a research observatory. McDonald Observatory Director
> Dr. David L. Lambert will be a featured speaker. The McDonald Observatory
> portion of the webcast will begin at 12:20 a.m. Central Daylight Time on
> April 4.

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> For more information: http://tinyurl.com/AstronomyWebcast

Also, the regularly-scheduled Painter Hall public viewing on Friday and Saturday falls during the 100 Hours, and the Saturday viewing is also during the 24 Hour Global Star Party. Both public viewings will start at 8:30 p.m. We're moving the remainder of the public nights (at Painter and RLM) to 8:30 since I messed up the schedule when I was setting it back in January (oops!).

Here's the website for the UT campus public viewing nights: http://outreach.as.utexas.edu/public/viewing.html

Gravity

Still a deep mystery. Objects of different mass fall with the same acceleration.

Explore how Einstein taught us to think about gravity: no force of gravity, but the effect of curved space.

Geometry on the 2D surface of the balloon

Exercises of drawing straight lines

Straight line on a curved surface, possible or an oxymoron?

Surface of the Balloon -

What is a straight line, what is not?

What is "inside?" What is "outside?"

Where is the "center?"

What does it mean to go from surface point to surface point "through" the balloon interior?

Real 3 D curved space (for us!!) might curve in a 4 D "hyperspace," but we do not directly perceive that hyperspace.

Can determine curvature, shape of 3 D real space by doing 3 D geometry.

Do not need to ask about 4 D (but will!)

One Minute Exam

In a curved space:

- A) Straight lines always connect to themselves
- B) Straight lines are the shortest distance between two points
- C) There are no straight lines
- D) The sum of the interior angles of a triangle is 180 degrees

Check out

Dr. Quantum in Flatland

Right in spirit, wrong in some essential details. See if you can figure out what those are.

http://youtube.com/watch?v=KhbGYn7aAUk

Embedding diagram - 2 D "shadow" of 3 D curved space, preserves basic aspects of geometry, whether curved or not, and, if curved, how.

Meaning of *flat space* in 3 (or higher) dimensions

If 3 D space is flat: C= $2\pi r$; sum of angles of triangle = 180° ; parallel beams of light never cross *in 3D*.

The embedding diagram of 3D flat space is a flat 2D plane

In curved 3D space, the flat space answers will be wrong: 2D embedding diagram will help to illustrate that.

Invert balloon - 2 D embedding diagram of curved 3 D space around gravitating object

Properties of this curved space that are preserved in the embedding diagram:

 $C < 2\pi r$

Sum of angles of triangle not equal 180° (can be > or <)

Parallel lines diverge or cross