

# Saguaro Astronomy Club



# Sacnews

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## Nominations & Elections

Well, as expected, the November meeting saw no further nominations for officers. As a result, motions were made to close the nominations and a vote was held to officially accept the nominees for officers for 2004.

The new officers are:  
President: Thad Robosson  
Vice-President: Jennifer Keller  
Secretary: Joe Macke  
Treasurer: Al Stieweng  
Properties: David Fredericksen.

Please join me in congratulating the new board and once again offering thanks to the out going board members: Vice-president Steve Coe, Treasurer Paul Dickson and Properties Rich Walker.

I need to pint out an error form last

month's issue regarding the elections. I had stated that all officers had come on term limits (two years). This was incorrect. Jennifer served as Secretary for one year and gave up the position to become Vice-President. Steve Coe decided not to run for re-election for personal reasons. I apologize for the error.

I've said it before and I'll say it again, the management of the club is not just the responsibility of the board, it is shared by all members. Remember you are welcome an encouraged to attend SAC Board Meetings (Held 1/2 hour to the regular meeting on odd numbered months). Your input will determine the course& future direction of the club.

Get involved

## Bits & Pisces

Our November 7th meeting started at promptly 7:30 without me. Joe Macke, Secretary for 2004, practiced taking notes on my behalf. Thanks Joe, you get the job! David Fredericksen noted upcoming events and graciously offers his home for our Holiday Party on December 6th. Thanks Olga!

It is with great sadness and reverence that we learned of the death of Vicki Ketelsen, the kind, caring, and patient wife of Dean Ketelsen, on October 23, 2003.

It was a close race but everyone who nominated themselves as the only person running for a 2004 SAC office was overwhelmingly voted in with 100% of the

votes: President Thad Robosson; VP Jennifer Keller; Treasurer Al Stiewing (not Greenspan), Secretary Joe Macke, Property Hauler, David Fredericksen. Congratulations!

Jack Jones thanked Joe Goss for setting up a scope for Desert Sage School. And mentions an upcoming school star party that was previously rain checked to December 3rd for The Wildflower School.

Steve Coe spoke on the Sentinel Schwaar Gaze on November 22nd. A Brrrrrr. cold front kept most of us away with only 4 attendees. I'm sure Pierre lived in Phoenix long enough to understand. Steve also had the idea to

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# NASA's Space Place

## Stardust

by Patrick L. Barry and Dr. Tony Phillips

Philosophers have long sought to "see a world in a grain of sand," as William Blake famously put it. Now scientists are attempting to see the solar system in a grain of dust-comet dust, that is.

If successful, NASA's Stardust probe will be the first ever to carry matter from a comet back to Earth for examination by scientists. It would also be the first time that any material has been deliberately returned to Earth from beyond the orbit of the Moon.

And one wouldn't merely wax poetic to say that in those tiny grains of comet dust, one could find clues to the origin of our world and perhaps to the beginning of life itself.

Comets are like frozen time capsules from the time when our solar system formed. Drifting in the cold outer solar system for billions of years, these asteroid-sized "dirty snowballs" have undergone little change relative to the more dynamic planets. Looking at comets is a bit like studying the bowl of leftover batter to understand how a wedding cake came to be.

Indeed, evidence suggests that comets may have played a role in the emergence of life on our planet. The steady bombardment of the young Earth by icy comets over millions of years could have brought the water that made our brown planet blue. And comets contain complex carbon compounds that might be the building blocks for life.

Launched in 1999, Stardust will rendezvous with comet Wild 2 (pronounced "Vilt" after its Swiss discoverer) on January 2, 2004. As it passes through the cloud of gas and dust escaping from the comet, Stardust will use a material called aerogel to capture grains from the comet as they zip by at 13,000 mph. Aerogel is a foam-like

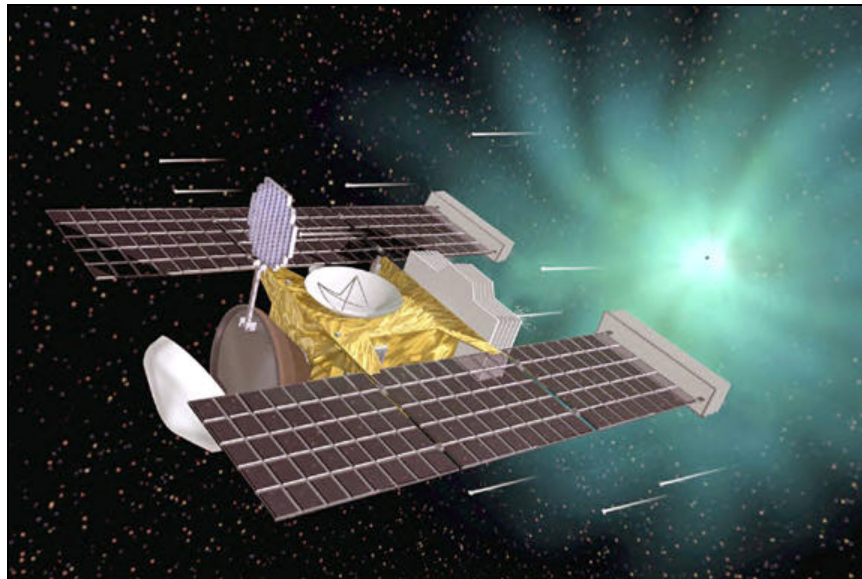
solid so tenuous that it's hardly even there: 99 percent of its volume is just air. The ethereal lightness of aerogel minimizes damage to the grains as they're caught.

Wild 2 orbited the sun beyond Jupiter until 1974, when it was nudged by Jupiter's gravity into a Sun-approaching orbit-within reach of probes from Earth. Since then the comet has passed by the Sun only five times, so its ice and dust ought to be relatively

unaltered by solar radiation. Some of this pristine "stuff" will be onboard Stardust when it returns to Earth in 2006, little dusty clues to life's big mysteries.

To learn more about Stardust, see the mission website at [stardust.jpl.nasa.gov](http://stardust.jpl.nasa.gov). Kids can play a fun trivia game about comets at [spaceplace.nasa.gov/stardust](http://spaceplace.nasa.gov/stardust).

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.



NASA's Stardust mission will capture dust from comet Wild 2 and bring them back to Earth for study.

# Some Thoughts on Gravity

## By D. R. Prescott, OCA Member

Few things affect us more than gravity. Surprisingly, very few people know much about it, other than that it holds them down to the ground. Yet, all material objects possess gravity--our Earth, the moon, the sun, galaxies, you, me, atoms, subatomic particles, everything! Some people even think that you can escape gravity in orbit because you feel weightless. In orbit, you are constantly falling in this force's clutches around the center of gravity, producing that often queasy, weightless feeling. What you weigh is caused by gravity and the resistance of the Earth's surface to your tendency to fall toward its center, or, alternatively, to be pulled by gravitons from the mass below (and here you thought it was what you eat!). You could lose a bunch of weight just by living on the moon; a one hundred thirty-pound human would weigh about 22 pounds on the moon. Weight is an effect of gravity, which you can control by where you are located at the moment--travel and lose weight, not a bad deal.

Mass, volume, and density are the real problems for our hypothetical weight-loser. This is a good time to clarify a few of important terms. Mass is defined as how much physical material makes up an object. Volume is defined as how big is that object. Density is defined as how tightly packed is the object. On the moon, you may weigh only 22 pounds, but your body will still retain the same mass, volume and density. So, your shape on Earth is still your shape on the moon--good or bad! Sorry about that!

Kepler, Galileo, and Newton, among others, grappled with the idea of gravity. In his Principia, Newton put on paper three laws of motion. They are:

1. A body tends to keep moving in a straight line and a stationary body tends to stay put--unless it is compelled to change because of some force, also known as the law of inertia.
2. Force acting on a body will change the momentum of the body in the direction of the applied force.
3. For every action there is an equal and opposite reaction.

These laws of motion and Newton's law of gravitation ( $F=Gm_1m_2/d^2$ ) set the stage for all of modern physics. Thus, Newton went down in history as the Father of Classical Physics, not to mention the fact that he invented calculus along the way. Until the 20th century, things were just fine. People went along calculating the motion of heavenly bodies with great precision, im-

pressing generations. Everything seemed to follow Newton's laws. Everyone was happy--almost. Then, at the turn of the last century, a new sheriff came to town, stepping out of a patent shop onto science's frontier streets with mental guns blazing. Our town was never the same again.

Here's where the question of gravity gets dicey. Dr. Einstein thought his way through the work of others, added just a little insight, sprinkled in a dose of genius and concluded, through some significant mathematics, that matter distorts space-time, creating the effect of gravity. The effect of Einstein's work made Newton's equations, at best, an approximation, although a very good approximation in practice. Strange things happen, or are more noticeable, the faster you go--mass increases, lengths shorten and time slows. Dr. Einstein outdrew nature, placed his smoking gun in its holster and created a different way of looking at space, time and gravity.

Newton's second law of motion says that force is equal to mass times acceleration. Little did Newton realize that in just over 200 years, gravity would be defined as a warp in space-time, or, more specifically, oscillations in space-time as a result of changes in the distribution of matter. It means that what you weigh here on Earth is because the Earth has sufficient mass to warp space-time so that you are always trying to fall toward its center. Could it be that simple? There is experimental evidence supporting it--like light from a distant star bending its path as it passes our massive Sun.

When one talks about quantum gravity, however, things called gravitons enter stage right. At the subatomic level, scientists believe that certain particles or light quanta act as conveyors of forces. There are four basic forces in the universe as far as we know at the moment. They are the Strong Nuclear Force, Weak Nuclear Force, Electromagnetic Force and Gravitational Force. Each has been associated with a carrier particle. The following table shows their individual characteristics, as discussed in "The Universe That Discovered Itself" By John D. Barrow, and reproduced on page 8. This table started the whole thought process that has found its way into this article.

You might notice that gravitation is weak and affects everything! While its range is infinite, like the electromagnetic force, gravity seems unusual, affecting everything including the other three significantly

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# Fuzzy Spot, Cetus

## By Ken Reeves

Welcome to my final installment of the Fuzzy Spot. It's been 7 years from my first column on Perseus, for a total of 84 columns. A big thanks to all the people who have read and found this column useful, a special thanks to the SAC newsletter editors, Rick Tejera and Paul Dickson, for making the maps to go with the column, and finally to Steve Coe for asking me to pick up where his What's Up column left off.

I'm finishing with one of my favorite Autumn constellations, Cetus. Cetus is a large constellation sitting out of the Milky Way, and therefore rich in galaxies. Though it only contains one Messier Object (M77), there are many galaxies in the reach of small telescopes, plus a wonderful planetary nebula. I've also included a few obscure galaxies that I like for one reason or another.

NGC 61A/B (00 16.5 -06 14): This interesting galaxy on the Cetus/Pisces boarder was observed in the 20" scope as a little faint, pretty small, and elongated N/S 2:1. There is a bright core with a possible second bright spot to the N. Using higher power shows both 'cores' but no more detail. There are 7 stars surrounding the galaxy.

NGC 157 (00 34.9 -08 24): This galaxy was seen in the 10" scope as pretty bright, pretty large, elongated ENE/WSW, and little brighter in the middle. Using averted vision makes it grow somewhat. The galaxy is situated between 2 stars N and S and the ENE end has a faint star. The star to the N is a nice double. In the 20" scope, it is quite large, pretty bright, mottled, disorganized, and elongated 1.5:1 NE/SW. A very slightly brightening towards the middle was noticed along with an occasional stellar nucleus.

NGC 246 (00 47.1 -11 53): This unexpected planetary nebula was seen in the 10" scope as very large, somewhat bright and irregularly round. There are 3 bright stars in the nebulosity, 2 stars just outside, and 3 or 4 more fainter stars involved. Using the UHC filter really helps emphasize the roundness of it, and shows some darkness in the middle. In the 20" scope with an O-III filter, it is very large, pretty bright, elongated 1.5:1 NW/SE, and annular. The E portion seems to be dimmer than the rest of the rim, and the W side is the most pronounced.

NGC 274/275 (00 51.1 -07 04): This nice galaxy pair was seen in the 20" with the separation being obvious, but they are touching. 275 is somewhat small, somewhat faint, and has a gradually brighter middle with a very bright stellar nucleus which really jumps out.

The elongation is uncertain. 274 is somewhat small, somewhat faint, and slightly brighter in the middle with no nucleus seen. There is a star to SW, but no other stars nearby.

NGC 309 (00 57.0 -09 57): This galaxy was seen in the 20" as large, pretty faint, and slightly elongated WNW/ESE 1.5:1. It brightens slightly towards the middle and contains a stellar nucleus which is obvious with averted vision, but comes and goes with direct vision. I suspected a clockwise spiral, but saw a definite mottling. There is a bright star to the N and a faint star to WSW just out of the halo.

NGC 1068 (02 42.7 -00 02): M-77 is the one Messier object in Cetus, and usually the first or second object searched for in a Messier Marathon. In the 10" scope, it is very bright, not too big, has a fairly bright halo and an extremely bright center with a possible non-stellar nucleus. There is a star to the E. In the 20" scope, it is pretty bright and somewhat large. The object slowly brightens toward the middle which contains a sudden very bright non-stellar nucleus. Using averted vision, the halo is very large and mottled. There is a star to ESE.

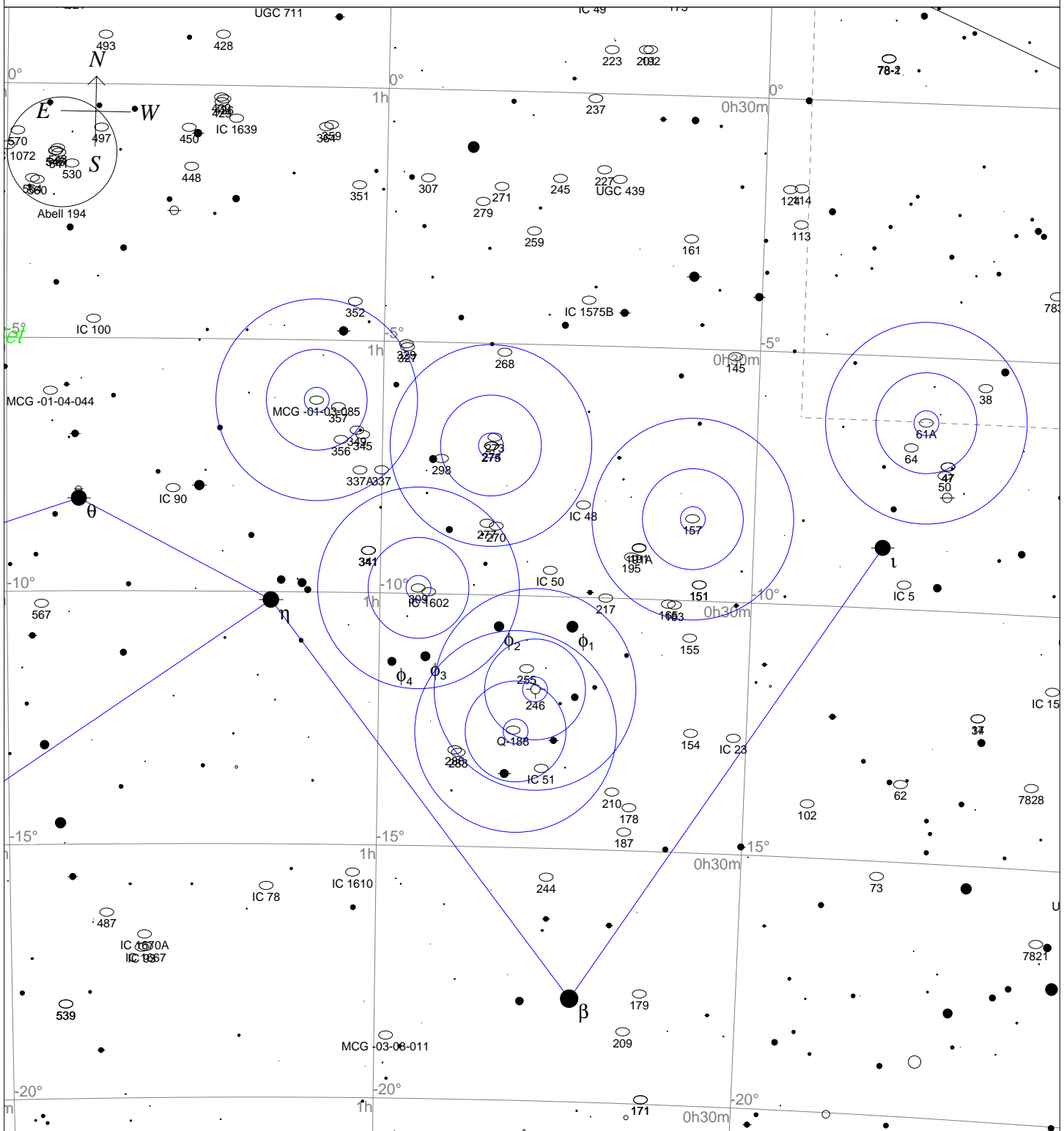
These last two galaxies have strange catalogue numbers. This first one is from the Sky Atlas 2000, and the second one is from Uranometria 2000.

New-1 (01 05.1 -06 13): In the 10" scope, it is very faint, pretty large, and slightly brighter in middle. It needs averted vision or moving the scope to really see it. There are stars surround it on the N, S, E, and W. Also catalogued as M-01-03-85.

Q6188 (00 48.8 -12 41.9): This peculiarly named galaxy is on Uranometria 2000 pages 261 and 262 just N of NGC 263. I could find no other catalog number for this galaxy, although I think Brian Skiff sent out an e-mail a while back on this object which I have long since deleted. In the 20" scope, it is slightly faint, pretty small, round, with a fairly bright middle and a very prominent stellar nucleus. There is not much else to this galaxy. (Ed. Note: Looking for this in Skymap Pro v9, which I used to generate the accompanying finder chart, the closest this I found was MGC 2-3-19. Per Skymap other names for this object are: PGC 2845, IRAS00460-1259, A 0046-12, MK 960, KAZA 2. No mention of Q-188. it is listed as: Magnitude: 14.0, Size: 42.0"x30.0", Position angle: 15°) One final note. Just because this series has ended doesn't mean you should stop looking for those fuzzy spots in the night sky!

Clear Skies

# Fuzzy Spot Cetus



**STARS**

- <3
- 4
- 5
- 6
- 7

**SYMBOLS**

- Multiple star
- Variable star
- ☄ Comet
- Galaxy
- Bright nebula
- Dark nebula
- ⊕ Globular cluster
- Open cluster
- ⊕ Planetary nebula
- ⊗ Quasar
- △ Radio source
- × X-ray source
- Other object

*Herschel 400 Objects: 157, 246, 247, 584, 596, 615, 720, 779, 908, 936, 1022, 1052, 1055*  
*SAC's 110 Best of the NGC Objects: 246, 936*

## Astro Bits

By Thad Robosson

Christmas has been interesting since I've been an astronomy buff. Now that the season is fast approaching, the question of what I want for Christmas has been brought up by the spousal unit. Hmm, what I want? The possibilities are nearly endless. Besides the ads in Sky & Telescope and Astronomy, and the catalogs we always seem to collect, I also have the Internet at my disposal in which to help decide indeed "what I want".

"How about the TEC 160 APO on the Paramount?" I state.

"How much is it?" she asks.

"Only about \$28,000" I respond knowing I have no chance.

"Not until I get my condo in Hawaii." She jokes.

"OK, how about the Televue NP101?" I ask.

"And how much is that?" She asks.

"About \$3600" I say with a straight face.

"Keep trying, you're getting closer." She retorts slyly. "Uh, are being serious?" she quizzes as I put on my best fake scowl as if she just shot down my dreams.

"Well, no, but it didn't hurt too much to try" I grin.

"Well, what do you want that we can afford?" She states in a "let's get serious" tone.

Well, now she's got a point. I truly do want the things I've asked for, but knowing I won't get them is all part of the plan. Let's get serious indeed. I move on to the next step.

"How about the new Televue Panoptic 41 mm? It's only \$495." I say.

"Well, possible. But I don't want to hear any whining about the credit card balance in January" She rebounds. I pretend to wince at

the thought. I'm such a good actor.

"Is there anything else?" She lightly demands, fully expecting another pricey reply.

Now this is where the final stage of my plan kicks in. Normally, I'm a bit remiss at spending \$50 for a book or gadget, but I've had a year to make a list of all the books and toys that I'd like to have, but either couldn't justify spending the cash at the time, or just kept thinking that "it'd be nice to have someday." Christmas is the perfect time to check a few items off of that list.

"Well, there are a few books, and a couple of gadgets. I think the total would be about \$175." I divulge.

"Write it all down, and give me prices and phone numbers." She says.

At this point, I disappear, pretending to "make" a list that I've already had made up for 2 weeks in anticipation of this moment. I'm confident that I'll get nearly everything on the list, and I pat myself on the back for my slick moves that got me into this position. I play some games on the computer for a while, and eventually head back downstairs to give her the list.

"So now, what do you want for Christmas?" I ask, handing her the page.

"Well, I've had my eye on this." She says as she opens a catalog book-marked with paperclips. She thumbs the thin tome open to a page splattered with jewelry, and then places her finger under the item of her desire. It's huge, and has a lot of big, shiny diamonds. "How much is that?" I ask, bracing for impact. "Oh, only about \$28,000" She says smiling.

# January 2004

SUN	MON	TUE	WED	THU	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

## Schedule of Events for December 2003 & January 2004

Dec. 6th	SAC Holiday Party at the Fredericksen's house. Directions on page 10
Dec. 8th	Moon is Full at 2037 mst.
Dec . 16th	Moon at 3rd quarter at 1742 mst.
Dec 20th	SAC Star Party at Flat Iron Mountain Sunset 1730, Ast Twilight: 1859, Moon-rise: 0536
Dec. 22nd	Winter Solstice at 0703 mst
Jan. 7th	Moon is full at 1540 mst
Jan. 9th	SAC General Meeting at Grand Canyon University at 1930, Speaker Dr. Fulvio Melia of the U. of A. His topic will be the Black Hole at the center of the Milky Way. This meeting will be preceded by a board meeting. Please feel free to attend.
Jan. 15th	Moon at last quarter at 0446 mst.
Jan. 17th	SAC Star party at Flat Iron Mountain Site. Sunset 1747, Ast. Twi. Ends 1915 Moonrise 0429.
Jan. 21st	Moon is new at 2105mst.

## Future Planning

Mar 20-21st	2004 All Arizona Messier Marathon at Arizona City
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(Continued from page 3)

stronger forces. This is where we must ask a question, "Are gravitons necessary?" The strong, weak and electromagnetic forces have had compelling evidence for the existence of their carrier particles. To date, I know of no one who has trapped, studied or fiddled with an actual graviton, or, even successfully measured a gravitational wave. I do know that people are working feverishly on the problem right now.

zero-mass particles, similar to a photon? Or, is it some sort of strange quantum effect, providing a vehicle for collapsing gravity's wave function, making the force between our two distant objects real and geometrically connected through the disturbing concept of quantum tunneling? Is quantum tunneling a part of gravity's character, making it possible to transfer geometric information instantaneously between two objects, like the spin of separated subatomic particles? The idea of

Einstein portrayed gravity as a basic effect of matter. Matter distorts space-time, making objects want to fall toward each other. So, if gravity distorts space, the amount of

Force	Range	Relative Strength	Influences	Carrier Particle
Gravitation	∞	10 <sup>-39</sup>	Everything	Graviton
Electromagnetic	∞	10 <sup>-2</sup>	Electrically Charged	Photons
Weak Force	10-15 cm	10 <sup>-5</sup>	Leptons and hadrons	W <sup>+</sup> , W <sup>-</sup> , Z
Strong Force (colour force)	10-13 cm	1	Colour-charged particles	Bosons Gluons

Table from The Universe that Discovered Itself, Table 4.1, Page 193, by John D. Barrow, Oxford University Press

instant transfer of information from one place to another distressed Einstein a lot. It broke his universal speed limit!

which is based on its mass, every atom in our bodies must exert its contribution to the sum of our body's ability to make things want to fall toward us. So, we are naturally attractive creatures!

Gravity lessens with distance, in concert with the inverse-square law. So, the farther away two objects are from each other, the less force one object attracts the other. If two objects are an infinite distance apart (assuming there are only two material objects in the entire universe), does space distort ever so slightly between them, making one attract the other from such an inconceivable distance? Does one know the other exists in a finite time? Would they, ultimately (given an infinite amount of time) fall toward each other from an infinite distance, orbiting each other until they bump together? From what I understand, the answer is probably yes. So, who needs gravitons when geometry can do the same job? All you have to do is distort space-time a bit and geometry takes over. Of course, who has an infinite amount of time to find out?

Another interesting question is: how fast do these distortions of space-time occur? If the effect of gravity happens at no more than the speed of light and by some happenstance our sun suddenly acquired more mass, our Earth's orbit would be affected to some degree about eight minutes later and no faster. Does that also mean gravitons are conveyors of gravitational forces at the speed of light? Would they be classical,

question still remains whether gravity is transferred by particles, by oscillations of space-time or both. Let's look at the problem from another angle. Picture the Earth. You dig a hole through the center to the other side. This is a thought experiment that Dr. Stephen Eastmond and I discussed one day at Tessmann Planetarium while fixing the planetarium. He used this imagery once in response to a young lad's inquisitive nature. It goes something like this.

You jump into the hole and begin falling toward the Earth's center. You accelerate to about 5 miles per second by the time you reach the center of the Earth, some 42 minutes later as calculated by Martin Gardner in his book, "Puzzling Questions About the Solar System". You continue on with decreasing acceleration toward the other side of the Earth, hesitating momentarily as you come to a full, very brief stop, and wave to astonished observers. Of course, gravity is tenacious and somewhere around the edge of the hole, you stop going up and begin falling back toward the Earth's center. You will do that, passing back and forth through the center of the Earth, less and less each time because of other external forces including friction, until you finally come to rest at the center of the Earth. If you could come to absolute rest at the center of the Earth, how much would you weigh? You're at the bottom of the gravity well where all falling stops, at least a single point of you. There is no place to fall from the center of

Where does that leave us? The

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(Continued from page 1)

make a Curt Taylor Memorial Planet-a-Thon in memory of another friend and amateur astronomer. Maybe everything will work out better next time.

Andrew Goodwin had more information regarding the use of Cherry Road and our Flat Iron Sites.

The January 2004 speaker will be Dr. Fulvio Melia speaking on the confirmed black hole in the middle of our very own galaxy. Jennifer took names of 13 people who would like to purchase his book at a discounted rate of \$20 instead of \$29.95. Fulvio is more than happy to autograph your copy.

Steve and Rosie Dodder were awarded the first of our brand spankin' new colored plaques for completing the SAC 110 Moon objects. Congratulations!

For Show and Tell, Rick Rotramel showed exclusive docudrama video of the October 24-25 All Arizona Star Party. Thanks for that--many good memories are lurking in that film.

The speaker was Brent Archinal, Astro-geologist for the United States Geological Survey, (the USGS) in Flagstaff. He spoke on the Mars Exploration Rover Missions--covering many aspects of the rovers that will land on Mars in January--the tools that are onboard, how and what they will analyze, the landing sites and why those sites were chosen, how the rovers will land, how the rovers were made, and everything else. Brent's job for these missions is modeling software to combine images to make mosaics.

Brent is also the author of the new book on clusters, open clusters, globulars, suspected cluster-friendly but not true cluster, etc. It is the most complete book on clusters and it is laid out in the best amateur astronomer user-friendly manner.

Well, these are my last notes as Secretary of SAC 2003. Thanks Joe M. for all your help last meeting. It's been a blast, but now I'm onto bigger and better things as the VP of SAC 2004.

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Earth's mass. However, your head and feet might try to fall toward each other ever so slightly prompted by your atoms' meager gravity.

At the center of the Earth, all Earth's mass surrounds you, not below you pulling you down, or letting you fall into it. Whether gravity is a distortion of space caused by mass or transferred by gravitons, wouldn't the planet's mass tend to also try to make you fall up, or pull you up by all those gravitons tugging from above, until some equilibrium is reached? Of course, this picture neglects other factors, but that's the danger with simplifications. It is likely taking an idea too far and missing an important point or two--such as everything above you still tend to fall toward the center, canceling out upward forces, likely crushing you out of existence. At which point, you really wouldn't care about how much you weigh.

So it goes with gravity. It is one of those things we know a lot about, to many decimal places. It currently separates classical physics and quantum physics. The other three fundamental forces (Strong Nuclear, Weak

Nuclear, and Electromagnetic) seem to play a different role than gravity. Gravity has geometric significance to everything, to all space-time. You also have M-theory (string theory) people suggesting that other dimensions--maybe six or seven or more--may explain universal expansion and gravitational shortcuts. Is gravity leaking out of our four-dimensional universe into spooky places we can't see? This is the stuff from which leading-edge physicists hope to find a theory of everything (with science fiction writers struggling to keep up with them).

We are touched by gravity everyday and from every direction. In spite of its pervasiveness and our efforts to unravel its secrets, what gravity really is still eludes us. Yet, it is a rather attractive subject, don't you think?

(Reprinted with permission of author. This article first appeared in the May 2002 Issue of the "Sirrius Astronomer" the newsletter of the Orange County Astronomers, [www.ocastronomers.org](http://www.ocastronomers.org), of which the author is a member)



## SAC Membership Services

Membership– Memberships are for the calendar year and are pro-rated for new members as follows: Jan– Mar: 100%; Apr– Jun: 75%; Jul-Sep: 50%; Oct-Dec; 25%.

- \$28.00 Individual Membership
- \$42.00 Family Membership
- \$14.00 Newsletter Membership
- \$ 7.50 Nametag for members  
(will be mailed to address below)

### Magazine Subscription Services

The following magazines are available at a discount to club members. Check the magazines you wish to subscribe to or renew, and pay the club treasurer. Please allow 3-4 months for the order to be processed.

- Sky & Telescope \$33.00/yr
- Astronomy \$29.00/yr

Please Print

Make Check Payable to : SAC

Name: \_\_\_\_\_

Bring completed form to a meeting or mail it with your remittance to:

Address: \_\_\_\_\_

City: \_\_\_\_\_ St: \_\_\_\_\_ Zip: \_\_\_\_\_

SAC Treasurer  
c/o Paul Dickson  
7714 N 36th Ave  
Phoenix, AZ 85051-6401

Phone: \_\_\_\_\_

- Check here if this is an update of information already on file.

E-Mail: \_\_\_\_\_

### SAC on the Internet

SAC has several E-mail mailing lists. To subscribe, send an email to the email address and put Subscribe in the subject box.

SAC-Announce@freelists.org: SAC-Announce is a mailing list for just club announcements, Typically 3-5 messages per month.

SAC-Forum@freelists.org: SAC-Forum is a general discussion mailing list. Topics should be related to Astronomy or SAC

SAC-Board@freelists.org: SAC-Board is a mailing list for discussions of club business. If you'd like to see how the club is run (or not run), or have a question about the club, this is the list to read. Typically month to month matters are discussed.

AZ-Observing@freelists.org: AZ-Observing while not a Sac list, is well attended by SAC members. This is the list to with observing places around Arizona. Find out where people are going and what they saw.

### Printed Newsletter

Sac can save a lot of money if you download the PDF version of the newsletter. PDF files are readable by both PC's and Macs. When the newsletter is published, a message will be sent to the address indicated above with the URL of the newsletter. Check the box below if you don't have access to the internet or if you prefer a printed copy.

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# SAGUARO ASTRONOMY CLUB

December 2003

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Videmus Stellae



May you all have a safe &  
happy Holiday Season

From the staff of SACnews  
Rick, Sue & Lindsay



## SAC Schedule of Events 2003-2004

### SAC Meetings

Sep 12th, 2003	Mar 5th, 2004
Oct 10th, 2003	Apr 2nd, 2004
Nov 7th, 2003	May 7th, 2004
Dec. 7th Holiday Party	Jun 4th, 2004
Jan 9th, 2004	Jul 2nd, 2004
Feb 6th, 2004	Jul 30th, 2004

### SAC Star Parties

Date	Sunset	Astronomical Twilight Ends	Moonrise	Site
Aug 23rd, 2003	1905	2034	0330	C
Sep 20th, 2003	1828	1952	0113	C
Oct 18th, 2003	1754	1917	0005	F
Nov 15th, 2003	1732	1857	2300	F
Dec 20th, 2003	1730	1859	0536	F
Jan 17, 2004	1747	1915	0429	F
Feb 14th, 2004	1814	1938	0327	F
Mar 13th, 2004	1839	2002	0328	F
April 10th, 2004	1859	2025	0124	F
May 15th, 2004	1924	2103	0404	C
June 12, 2004	1942	2127	0234	C
Jul 10th, 2004	1943	2126	0105	C
Aug 7th, 2004	1924	2058	2335	C

### Deep Sky Group Meetings

Sep 18th, 2003	May 13th, 2004
Nov 13th, 2003	Jul 8th, 2004
Jan 15th, 2004	Sept 2nd, 2004
Mar 11th, 2004	Nov 4th, 2004

F= Flat Iron; C= Cherry Road