SIDEREAL TIMES

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Amateur Astronomers Association of Princeton

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From the Director

Last year at this time I reported on an extraordinary run of observing nights in which I had the rare opportunity of completing two successful Messier marathons in the course of 3 days. I also remember suggesting to AAAP members (maybe in a different article) that when you have the opportunity to go out and observe you just need to do it because some of those nights will be real winners. This year I have an amusing counter example. On the night of March 16th we planned to have a club Marathon at our observing site in Jenny Jump State Forest. I had fully expected to attend until one of my daughters got sick and the weather started looking very unpredictable. So, contrary to my own advice I decided not to go to Jenny Jump.

At about 7:00 I went outside hoping to make myself feel better and found that there were heavy spotted clouds overhead and I was (almost) sure that I had made the right decision. Gloating, I went to the Web to check the weather maps only to discover that if it were going to be clear that night anywhere in New Jersey it would be over Jenny Jump! From other reports of club members (probably reported in this same issue), the skies did indeed clear in the early evening...and a few lucky souls got a great look at the new Comet Ikeya-Zhang (C/20002 C1) thanks to Bill Murray.

In a guilty panic I called fellow member Bob Vanderbei who lives about 10 miles North of Princeton and asked him what the sky was doing up there. In spite of the fact that I had just awakened him from a nap he went outside to discover an incredibly dark and clear sky (almost unheard of in Princeton!) I asked if I could come and park on his lawn and have some fun with whatever was left of the night and he agreed. So I made a beeline for that neck of the woods with my 18" Obsession packed in the back of my van. After about 20 minutes of trying to see through the soup in the Western horizon I completely gave up on even bright objects such as Andromeda. I bopped around the sky a bit getting my bearings and checking the seeing and found that overhead the sky was both dark and still. When I tried to point out a galaxy location to Bob using my green laser pointer I discovered that the sky was so moisture

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Simpson Observatory (609) 737-2575

Messier Marathon 2002

On Saturday, March 16th the AAAP held its annual Messier Marathon at the UACNJ observatory complex at Jenny Jump. Every year at the time of the new moon closest to the spring equinox it is theoretically possible to view all the 110 deep sky objects on Charles Messier's list in a single night. Last year during the Messier Marathon I was able to view 101 M objects with my 4" Genesis refractor up at Jenny Jump. I wanted to try to better that total this year so I planned to use the AAAP's 12.5" reflector instead of my refractor. This, I hoped, would make it a lot easier to pick out some of the dim galaxies in Virgo that I had trouble with last year.

I arrived up at the Jump about 5 PM on Saturday afternoon. When I had left Bordentown the weather had been completely overcast but a front was coming through from the north and by the time I got up to JJ it was completely clear.

AAAP members Ralph Marantino, Ron Mittelstaedt, Larry Smith and Daryl Foyuth had already arrived for a UACNJ board meeting that afternoon and planned to stay for the marathon. Vic Belanger arrived later. I claimed a bunk in the bunkroom and donned my cold weather gear and went out to open the observatory about 6 PM as the sun was setting.

The Messier Marathon is a tough challenge. There are several objects you have to view in the twilight right after sunset. If you wait even a half hour they will set or be too low to view. Last year because of a cloudbank that persisted in the west after sunset I missed M74, M77, M33 and M110. I wanted to see if I could catch them this year.

I moved the scope to the position of M74, the first object on the list, (and one of the toughest) but I was in for a surprise. As I was scanning the star field for the position of M74 I ran over Comet Ikeya-Zhang (C/2002 C1). I had read about this comet on the Sky&Tel website. From what I had read I expected the comet to only be about 4th or 5th magnitude. However, it was much brighter than that. The nucleus and coma were bright enough to see in bright twilight. (I estimate that they were 2nd magnitude.) Later as the sky darkened the comet sported a nice 5-degree tail in binoculars and

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and dust free that the laser was totally useless! After that I rescued the evening by spending the next couple of hours nailing about 40 Messier objects centered around and including all those in the Coma and Virgo clusters.

Later that week I participated in an interview with Neta Bahcall from the Princeton Astrophysics Department (and a previous speaker at an AAAP monthly meeting.) Her topic was how her work has added to the knowledge of cosmology by learning from what we can see and measure about galaxy clusters and super-clusters. She noted that this entire research direction came from nights when she walked out under the stars thinking about the nature of the very clusters we can see as amateurs and how there must be masses (pun intended) of information hidden in those very groupings. So once again (though I almost missed it!) a relatively small observing experience left me with a much grander sense of the beauty of the night sky and the vast amount of information we still need to gather about it. I hope a small sense of something similar reached the minds and hearts of all others who were out on that night hunting their Messier fuzzies.

Hot topics for this month: -continuing updates on Baldpate mountain observing -thanks for yet more contributions of energy from club members

I am happy to report that Gene Ramsey called me this week to say that the landscaper arrived and reworked the area behind the Washington Crossing observatory and planted new grass seed. He has roped off the area behind the gravel area to give the grass a chance to grow so please be careful if you are out there observing. Happy star hunting and a million thanks to Gene for his efforts to improve our observatory.

Kirk

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finders. Just before it set behind the tree line it became a naked eye object. This is definitely the best comet that I've seen since Hale-Bopp. Just goes to show that if you continue looking at the skies you may be pleasantly surprised occasionally.

As a matter of fact I never did get M74. This galaxy is very dim and trying to view it in twilight is tough. However, I was able to get M77, M33 and M110 easily so I figured I was ahead of the game.

Over the next four hours I managed to bag all the winter and spring Messiers. The big scope was a definite plus in picking out the Virgo galaxies. Just after midnight my total stood at 68. At this point all the remaining Messiers were in the summer constellations and would not rise high enough to view for several hours. I went into the bunkroom to take a nap.

I woke up a little after 3 AM and went out to finish the Marathon. Unfortunately, the weather had deteriorated. Patchy clouds and haze filled most of the sky, especially the southeast where most of the remaining Messier objects were. I struggled on until about 5 AM when dawn began to light up the sky but I was only able to bag another dozen Messiers.

So my total this year was 80, not as good as last years total of 101. However, I was encouraged because I was able to get all of the early evening objects except M74. I now know that it is possible to view at least 104 of the 110 Messier objects on marathon night from Jenny Jump. Guess I'll just have to wait until next year.

Bill Murray

Minutes of the

RegularMeeting of the AAAP

March 12, 2002

Director Kirk Alexander called the meeting to order at 8:25 PM.

Program chairman Mark Lopez introduced the evening's speaker, Dr. Orsola DeMarco of the American Museum of Natural History. The title of Dr. DeMarco's talk was "Born-Again Stars and other weirdoes in a stellar geriatric garden". The talk was well received.

After the talk Kirk noted that the club would be holding a Messier Marathon at the UACNJ observatory complex at Jenny Jump on Saturday, March 16th. All AAAP members are invited to attend. Kirk also thanked those people who had volunteered to help with Jersey Starquest and other AAAP activities.

Observatory chairman Rex Parker reported that the club would be holding a special observing night on Saturday, April 6th (rain date: Saturday, April 13th) at Baldpate Mt. (about 2 miles from the AAAP observatory at Washington Crossing) to test out the feasibility of the location as an observing site. Those interested in attending should contact Rex to confirm attendance. They will meet at 7 PM at the gate of Washington Crossing Park (Rt. 579) and then travel to Baldpate Mt.

Kirk also reported that a group was surveying members of clubs active at Princeton about their opinions on foreign affairs. Participation is voluntary but every participating member will earn a $10 donation to the AAAP. See Kirk for details.

During the business meeting Kirk read reports from Starquest chairman Don Monticello and Treasurer Pete Oppenheim, both of whom were unable to attend the meeting. Don reported that the flyers for Starquest had been finished and mailed to past Starquest attendees. The flyer was also published in the March issue of Sidereal Times. Pete reported that the current treasury balance is $8,847.31. There are currently 152 members.

Rex agreed to take the position of nominations chairman. The slate of officers for the 2002-3 term will be presented at the April meeting. Elections will be held in May.

Secretary Bill Murray announced that Dick Peery of the NJ State Planetarium had requested club members to bring scopes for solar observing during a special Space Station program on the weekend of May 4-5th. Gene Ramsey and John Miller volunteered to help. Bill also reported that the four Fridays in May and October would be planetarium public nights.

Rex reported that he had been talking with Hopewell township officials about ways of increasing interaction and cooperation between the township and the AAAP. To this end the Friday public observing nights will be published in the township activities brochure. Sidereal Times editor Vic Belanger noted that the brochure could also advertise his "Introduction to Amateur Astronomy" class, held at the park nature center, in September.

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What Ever Happened To The Old Ether (Aether) Theory?

By Conrad Miller

For some years, I have read articles and papers, and listened to lectures by cosmologists and other experts in astrophysical matters. To me, the subject of greatest interest has been dark matter or dark energy. (If $E=mc^2$, they must be the same thing, or so it seems to me.)

According to theory, gravity alone is not sufficiently strong to hold the universe in its present configuration. It is believed that the attraction or force of dark matter is required to prevent the universe from expanding at a faster rate than previously believed. Dark matter has never been seen. But according to many cosmologists, its force in the universe is far greater than that of gravity. This is deduced by the response of galaxies or nebula to gravity. There must be another force than gravity to account for the responses.

Many knowledgeable cosmologists now feel that we are moving closer to the answer of the mystery posed by dark matter.

A somewhat similar problem or mystery was introduced around the turn of the 20th century when radio telegraph was invented. Guglielmo Marconi, an electrical engineer and inventor, developed radio transmitters before the vacuum tube was perfected in its triode configuration as an amplifier of electrical signals.

In 1901, Marconi transmitted long wave radio signals across the Atlantic, creating quite a stir in the scientific world. A high-speed mechanical electrical alternator driven by a strong electrical motor generated Marconi's signals. Frequency was determined by the speed of the alternator, and the signals were on the order of 12 kilohertz (12,000 cycles) radiated from an antenna network almost a mile long.

Typical of these geographically long, low frequency arrays was an antenna that crossed the Raritan River. It ran across the river from New Brunswick to a field near Highland Park, New Jersey, and was in place until the 1930s as far as I can remember.

As a kid, I recall riding my bike near the transmitter shack, wondering what that singing sound was, coming from the shack. Of course it was the motor/alternator pumping its approximately 10-kilohertz signal into the enormous rhombic antenna far above the banks of the Old Raritan.

The work of Marconi and associate engineers stirred a controversy among scientists and physicists: What carried radio signals through space? Articles, papers and lectures were plentiful as those on dark matter are today.

Enter ether

Why it was called "ether" I would have never known until my son John said it was originally called "aether " derived from the Greek meaning "upper air." However, it is in no way related to the chemical previously used by doctors to put people to sleep.

A postulate widely accepted early in the twentieth century was that all space is filled with a fluid having the following characteristics: (Some of the words seem to border on the contradictory.)

- Transparent
- Undispersive
- Incompressible
- Continuous

This fluid was supposed to act as a medium for the propagation of light, analogous to the manner in which sound is propagated through matter, such as liquid, gas and solid material. Later it was regarded as a medium for the propagation of electromagnetic energy, such as radio transmissions. Attempts were even made to describe matter in terms of vortices in ether! But serious scientists brushed these attempts aside.

It was getting to the point where excess phenomenon was being credited to ether. (Is it possible that dark matter is now being pushed into that position? Highly unlikely, in my opinion.)

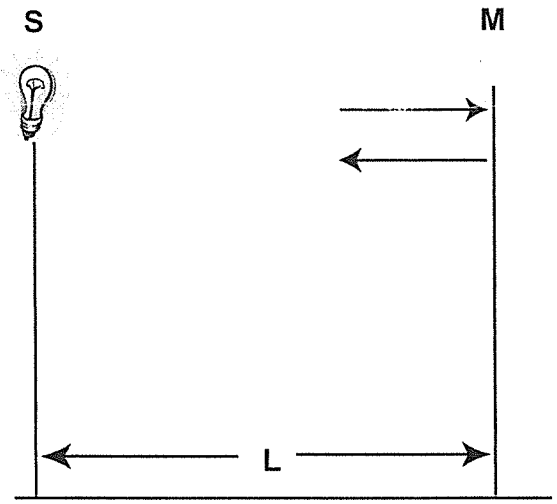
The Michelson-Morley experiment

This experiment took the wind out of the ether theory, already viewed with jaundiced eyes in scientific circles.

The facts: In 1881, two American physicists, Michelson and Morely, carried out an experiment destined to raise great doubts regarding behavior of the supposed ether. Ultimately the experiment would revolutionize a large part of our thinking about physical phenomenon.

The experiment

A source of light **S** and a mirror **M**, facing the light source, are mounted on a rigid base at distance **L** apart. (See figure.) Light travels from **S** to **M** and back in a certain time, expressed by $T_1 = 2L/C$, where C is the speed of light.



A source of light S and a mirror M facing it, are mounted on a rigid base at distance L. Light travels from S to M and back in a time expressed by T = 2L/C, where C is the speed of light.

Now suppose the whole apparatus is set moving lengthwise with a speed **V**. If this is actually the relative motion of apparatus and ether, so that the ether is "blowing past" the source and mirror with speed **V**, then a very simple calculation shows that the time now required for the journey **SM** + **MS** should be greater, namely:

$$T_2 = 2L/C\ (1-V^2/C^2)$$

It is true that the term V^2 / C^2 is very small, but by utilizing the earth's orbital speed of about 18.5 miles per second as the value of **V**, the change to be expected was brought well within the range of observation. This was accomplished by turning the whole

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apparatus first across, then parallel to the earth's orbit.

No difference whatever could be detected between observations in the two positions. The result indicated that $T_1 = T_2$. No one else has yet been able to obtain even an approximate approach to the effect predicted by Michelson and Morley. Naturally, this aroused considerable speculation; just as now, over one hundred years later, we see highly qualified scientists speculating on the effects and composition of dark matter.

Returning to Michelson and Morley's experiment, the only satisfactory explanation in classical terms was that offered by Lorentz, following a suggestion by Fitzgerald, and known as the Lorentz-Fitzgerald Contraction, which has now been incorporated in the foundation of the special relativity theory.

The Lorentz-Fitzgerald Contraction

Regarding the results of the Michelson-Morley experiment, Fitzgerald suggested when a body moves through space, it experiences a compression in the direction of motion. Lorentz showed how such an effect might be expected on the basis of the electromagnetic theory and the electrical constitution of matter. That is, Lorentz deduced that when a body moves through space, its dimension parallel to the line of motion should become less by an amount depending upon its speed.

For the earth moving in its orbit (about 18.5 miles per second) the contraction is about one part in 200,000,000. This, on the diameter of the earth, would be a tiny 2.5 arc seconds. Small as this is, it accounts exactly for Michelson and Morley's result by making the source of light and the mirror draw closer together when the system moves lengthwise (this had not been mentioned earlier).

The Kennedy – Thorndike Experiment

In 1932, this experiment was conducted as a modified form of the Michelson-Morley procedure. However, here the path lengths of a split beam were made unequal. The Fitzgerald-Lorentz contraction hypothesis would then be unable to explain the null result (I have no further information on the exact procedure).

Ether is laid to rest

While perusing an old physics textbook that had been printed in the 1950's, I found that ether was not eliminated from all discussions. Regarding ether, the old book said as follows:

"Many facts about light and radio can be explained if they are transmitted by waves of different lengths. But numerous scientists do not think waves can be explained unless there is some material or matter for them to travel through. They propose that it exists, even while trying to find out more about it; and they call it ether. Other scientists say there is no ether. They speak of bits of energy called quanta which needs no material to carry waves through space."

Enter quantum theory

As we know now, quanta was on the right track. The quantum theory of spectra is an idea that there exist in each atom certain energy levels. An atom absorbs or radiates energy as it moves from one level to another. The frequency (ν) of radiation with such change in energy level is given by:

$$E1 - E2 = h\nu$$

E1 and E2 are energy levels, and h is the Planck constant.

And that ends ether for which no one could even write a valid equation – because it never existed.

Dark matter lurks behind the curtain

As I write, dark matter seems to be in the same situation as ether was many years ago. Cosmologists know what it does, but they don't know how it functions. Not yet.

My personal feeling, based purely upon what I read and hear, is that within a decade or less, scientists will have some significant answers to the mystery of dark matter. Recently, I gave my amateurish opinion about dark matter to one of the leading cosmologists at Princeton University. She smiled, and giving me a knowing look, seemed to say, "We're getting closer."

Some day in the future, I expect that her answer may be, "...Quod erat demonstrandum."

About the Author Conrad Miller has an engineering background, steeped in mechanics, electronics, and physics. Having studied at Cornell and Rutgers, Conrad joined the Woods Hole Oceanographic Institute and participated in on-site scientific studies as part of the famous Operation Crossroads nuclear weapons tests, 1946.

Miller has been an owner of an engineering company, editor of several national boating magazines and prolific writer (hundreds of technical articles and half a dozen books). Born in Staten Island, NY in 1918, and raised in Metuchen, NJ, Miller currently lives in North Edison, NJ.

It was Conrad's use of a Questar telescope in the early 1960's that sparked his son John's lifelong interest in astronomy. John Miller we all know as our Webmaster.

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Some of these public nights may be held in conjunction with special planetarium programs. Township officials also approached Rex about the possibility of having several AAAP members act as guides for a trip that they are planning to the Rose Center (Hayden Planetarium) on September 7th. Discussions are ongoing.

Rex reported that, as of Friday, March 1st, the observatory is open for public nights. Public nights are the first and last Fridays on the month. The water in the observatory has not been turned on yet but Rex will attend to this shortly. It was agreed that the observatory would be closed on Friday, June 7th due to the conflict with Jersey Starquest.

Ron Mittelstaedt will change the answering machine message at the observatory to reflect this.

Gene Ramsey reported that the contractor is ready to begin the job of leveling the grounds near the observatory. Gene will donate grass seed for the new observing area. Gene and Rex will contact the contractor and the park to arrange a suitable date for the contractor to begin work.

There will be a board meeting on Thursday, May 2nd at Kirk's new office in the Frist Campus Center.

Larry Smith reported that, after the bankruptcy of Pocono Optics, an auction of their remaining stock would be held at 10 AM on March 30th at the Holiday Inn Conference Center (at the intersection of I-78 and Rt. 100). Larry asked for volunteers to

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Amateur Astronomers' Association
of Princeton
Officers and Committee Chairpersons
March 24, 2001

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							Fax 874-3524		Past Director	
Mr.	George	Walker	180 A Old York Rd.	Trenton	NJ	08620	(609) 298-3227	(609) 298-2015	Exhibits and	
								(609) 896-1200	Promotions	

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attend the auction and purchase door prizes for Starquest.

Vic Belanger reported that the deadline for the April issue of Sidereal Times would be Friday, March 22nd.

The meeting was adjourned at 9:50 PM.

Bill Murray
Secretary

Deadline for the May Issue
of the Sidereal Times
Wednesday, April 30, 2002

April 2002

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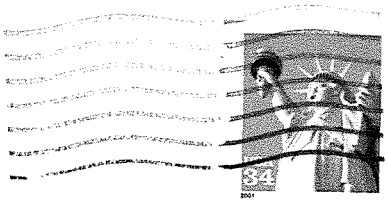

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