



# The Spectrum

Buffalo Astronomical  
Association, Inc.

Darwin Christy, Editor

NOVEMBER - DECEMBER 1979

November meeting:----The November 9th meeting will be held in the New Science Building Auditorium at Buffalo State on Elmwood Avenue. The evening speaker will be Dr. Duane Anderson who will speak on, "Water and Ice on the Icy Moons of Jupiter." We welcome Dr. Anderson.

?????????QUIZ?????????

- #1- What side of the Moon is always darker?
- #2- Did you ever hear of the 'Stark Effect'? What is it?
- #3- What are types of 'Invisible Astronomy'?

December meeting:----The December 14th meeting will be held at Buffalo State on Elmwood Ave. This is our Christmas meeting, so lets make it a BIGGIE (not Ken). Our speaker for the evening will be our own Mrs. Geiger (candid camera) and her photos. She has a way of showing us how we look without pose. Two other short presentations will be given by Ken Kimble and Paul Schenk, both members of the Buffalo Astronomy Association.

For emergency cancellations of meetings----WBEN (930) Radio will be the designated communication in case of severe rains, flooding, heavy shows, earthquakes and the like. For more information you may call any of the Officers or Board members. They are listed in the BAA Membership roster. Our President, Dr. Fred Price can be reached at 878-5215 or 878-5023. This note should be clipped and saved for future reference near your telephone----in case----

From the editor:----I am not too happy with the response I have gotten, as far as articles are concerned. I still need articles for up and coming 'Spectrums'. I cannot be the sole contributor of articles, SO-----let me hear from the members. I can use short notes of what is happening in the satellite groups, study group, instrument group and even the Beaver Meadow Observatory. The deadline for the next 'Spectrum' is December 21st.

I forgot to mention that Tom Dessert was the observatory director in the last issue of the 'Spectrum' with the officers and newly elected Board members. Sorry Tom. He has been reappointed by the Board to that post for 1979-1980. Congratulations Tom.

I hope that my first editing of the 'Spectrum' met with your approval. Whether it did or did not, I would certainly accept any comments, good or bad, and above all any helpful criticism.



Attending a conference on third world countries at Harvard University was exciting enough, but still I was looking for that something extra. You see, Sky & Telescope's offices were supposed to be just down the road from my hotel, so, during a 2 hour lunch break, I set off to see the place where my atlas was published and to buy a Vol. 3 Burnham's Handbook. As I walked down Concord Ave., I noticed a windmill turning in the breeze. Being interested in such things, I stopped in to check out their products and books and get some directions. Well, they never heard of a Sky & Telescope or whatever I wanted. So, with an eye on my watch, I continued my quest.

As I walked, I looked into the various shop windows. In one, I noticed a cardboard sign with the letters AAVSO on it. Well, calculating the variables involved in such a coincidence are just astronomical! This was the place to ask directions. A very friendly woman of about 40 came out to the sidewalk to point the way. I thanked her and asked if she was an astronomer. She said, "Yes, in fact, I am the National Director of the AAVSO." (Mrs. Janet A. Mattei). I told her I was a deep sky buff and she assured me that someday I too would get into variable stars. We shook hands and I continued on my journey.

Now, proceeding with professional directions, I found the office. After just a few technical questions, the secretary called the executive editor, Lief Robinson. He was very friendly, helping me with an inaccuracy Rowland Rupp and I discovered in the Becvar Catalogue. I then spent sometime complimenting his magazine -- cleverly leading up to my punch line - quote, "There is this guy in our club named TOM," I said, "whose patience is running out. When are you going to print some of his deep sky photos?" "What a coincidence! Dennis DeCicco has just started compiling a file of amateur deep sky stuff." That should be interesting news to all of our members. So, after a little more friendly conversation, I hit the road.

As I was returning, I again casually looked up to see a sign which read, "The Smithsonian Astrophysical Observatory" and "Harvard College Observatory." There I stood, torn between astronomy and third world statistics. The third world won.

Moral:- Visit Cambridge (Great bookstore too)

Sub-moral:- Astronomers are friendly

BAA ANNALS

Rowland Rupp

5 YEARS AGO - Walter Semerau spoke on "Recent Activity on the Sun" at the November 1974 meeting. Walt, a nationally recognized amateur expert on solar astronomy, is an honorary member of the BAA and a Fellow of the club. We had astronomical films made in the middle 1950's at our Christmas meeting.

Warren Steinberg reported on the October meeting of the Instrument section. Bill Deazley had brought his 12½ inch mirror and his home-made caustic tester. Carl Milazzo's 4¼ inch had also been tested.

10 YEARS AGO - "UFO's - Fact or Fiction" was Ray Manners' topic in November 1969. I wonder what he concluded--apparently he didn't have the final say--the debate still goes on. Ed and Olga Lindberg spoke on clocks and sundials in December. Edith Geiger followed with her candid photographs.



The November 1969 Spectrum carried an article by Ernst Both, "The Lunar Crater Plato: Mysteries Remaining." He talked about features observed only once or twice, suggesting either a transient phenomenon, or perhaps too few detailed observations were made of what are regarded as well known objects not worthy of further study.

Dick Zygmunt and Dale Hankin had just finished a roll-off roof for the Camp Sprucelands observatory. Its telescope, a 4 inch, f/15 refractor built by Dick, was often used by the BAA at star parties. Bob Schneider bought the telescope when the camp was sold a couple of years ago.

15 YEARS AGO - The Spectrum was different then; they were published monthly, but each issue was just a single page of ditto. Ernst Both gave a talk on "Solar Activity" in November. Ron Clippinger spoke on observing and Edith Geiger showed pictures taken at summer star parties for the Christmas meeting.

The rest of the newsletters were taken up with notices of section meetings--the Instrument Section, the Advanced Study Section and the Advanced Observing Section. We once again have a Study Section, only it's not so "advanced" this time. Now anybody, advanced or not, can benefit from attending these informal gatherings. Try it and see!

#### SPY AND TELL

Edith L. Geiger

Congratulations! An 8 lb. baby boy was born to Nancy and Charles Miess on Oct. 3rd. His name is Adam.

On Sept. 23rd, Darwin Christy and Carl Milazzo, in separate observations, noticed a strange satellite that flashed like a strobe light roughly every 5 seconds, slowly changing from +4 to +2, then for 1/10 of a second suddenly flashing to a -2. This pattern kept repeating for the approximate 3 minutes that it was observed.

Richard Janas is employed at Science Kit in Tonawanda, and is also working on his Master's at U.B. in the evenings, majoring in economics.

Richard is a very generous blood donor and has been giving blood for a number of years.

On sunny days, Tom and Jim Pasek work on sunspots with their 12.5" reflector. Tom has a rugged schedule at the Post Office on William Street. Sometimes he works from 3:00 - midnight and sometimes from midnight 'til morning.

Brother Jim, who is a student majoring in food preparation at Emerson High School, obtained the highest mark in the school last year. After high school, he plans to go off to a private school to study to become a chef.

Phil Cizdziel is in his fifth year at U.B. working on a double Bachelor's degree in physics and astronomy. He teaches two astronomy labs, Tuesday and Thursday evenings, at the university.

The Kimbles have remodeled their home making some window changes on the outside, and building a family room in the basement.

Adrienne breeds tropical fish for her own enjoyment, so if there is something fishy going on in the family room it will be in her two-10 gal., one - 5 gal., and one - 20 gal. tanks.



Tom Giasomo, who already has a Master's in physics is working on a Master's in business in the evenings at U.B. He is taking courses in organization psychology, and probability and statistics.

Paul M. Schenk has served a two month internship at the Jet Propulsion Laboratory in Pasadena, Calif. as part of the NASA Planetary Geology Internship Program. He was one of 18 students chosen for the program from across the nation. As part of his work, Paul was helping the Saturn Working Group prepare the pre-encounter planning for the Voyager I encounter with Saturn, November 1980. He also helped analyze data beamed from the Voyager spacecraft when it flew past Jupiter in July.

Gil and Mrs. Brink returned from a trip to Long Island in October where Gil attended a conference at Brookhaven National Lab. Gil and son, Dave, have been taking numerous pictures of deep sky objects. They do their own developing and printing.

Dave, who will graduate from Williamsville South High School in January, is planning to start college in the same month, majoring in astronomy. Dave spends two evenings a week tutoring a younger student in math. He has been a lab assistant for a professor in the Department of Physiology at U.B. for the last year.

The Biggies went to New Hampshire for four days in mid-October to attend a wedding. Ken has purchased some skis, so his weekends will probably be all down hill for the winter.

For our September meeting, there were doughnuts and no people, and for our October meeting there were doughnuts but there was no coffee. Let's hope that we can get it all together in November.

#### FOR SALE

BINOCULARS - Hi-power (10 x 50), C.F.C. fully coated-achromatic lenses. Complete with carrying case. Like new, only used twice. Call 884-1724.

Setting up your own shop at home? I have tools for sale at reasonable prices. Bench Lathe, Drill, Files and many other miscellaneous tools. Call Harold Gouber at 884-1724 for further information.

4 month old Meade 6" Model 591 - \$280 - Present factory and shipping costs are \$324 - Call 691-8525.

Celestron 90 Astro Telescope complete with fork mount, drive, slow-motions, eyepiece, barlow lens, and carrying case. Retail cost new - \$495. In absolutely mint condition. Will sell for \$325. Contact Larry Carlino, 435 Niagara Falls Blvd., 832-0491.

#### DUES

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Dues are due----Due to the costs rising everywhere, we too feel we had to raise our dues to help defray costs. Dues are now \$5.00 for students and senior citizens --- \$10.00 for regular members --- \$15.00 for family membership. You can mail your dues to Mrs. Edith Geiger, 6191 Ward Rd., Orchard Park, N. Y. 14127, if you wish, or pay her at the meetings.



Born in Elmira, N. Y., Jack received his early education in the town where gliders soar over the Chemung River Valley in motorless flight. As a senior in Elmira's Notre Dame High School, he was awarded a math prize as well as two Regent scholarships.

With a strong interest in science, he enrolled at Fordham University to major in physics. During the summers he worked for his father, a local builder, and also spent some time working as an intern at Westinghouse. After graduating from Fordham, it was on to Washington, D.C. and Catholic University where he earned his doctorate in physics.

While at the university, Jack met a professor, Dr. Stewart Bowyer, whose suggestion that Jack go into x-ray astronomy, changed the course of Dr. Mack's career. Dr. Bowyer moved to the University of California at Berkeley. Jack followed him there and remained for three years working on research projects. His thesis, entitled, "Galactic X-Ray Sources," was then defended back at Catholic University.

As a student at the University of California Space Sciences Lab overlooking San Francisco Bay, Jack worked on the Lab staff on exciting experiments with high altitude balloons which flew detectors to study x-rays in space, and with rockets to do lower energy x-ray studies. This project took him to Alamogorda Air Force Base in New Mexico, where balloons were used to carry detectors of x-rays above the atmosphere, and to Brazil where two rocket experiments were launched to study x-rays in the southern hemisphere of the sky.

It was while Jack was at Berkeley that he met the future Mrs. Mack, Jayne DuMont, an English teacher and a graduate of Mills College, Oakland, California. Jack went on to become a research associate at NASA's Johnson Space Center at the University of Houston, and also a research associate at the university. There Jayne completed her Master's course work at the University of Houston. Then she re-entered teaching and had a great honor bestowed upon her in being the recipient of the Outstanding Young Educator Award given by Houston's Junior Chamber of Commerce. Jack worked on x-ray astronomy and cosmic ray physics, and in addition found time to invent a detector for extremely high energy particles. This detector was a highly specialized instrument.

He started to teach part-time in the local colleges and discovered that he enjoyed this experience very much. In the summer of 1973, he came to Buffalo to teach at SUCB. Jayne finished her thesis after moving to Buffalo, earning her Master's in English from the University of Houston. Her work was the first thesis on the writing of James Leo Herlihy, a contemporary novelist and playwright. She is certified to teach both English and history though, so far, she has taught mostly English. Jayne was appointed as a teacher at Kenmore East High School in 1973 and continued there until 1978. She is now teaching at Williamsville East High School.

For three summers Jack journeyed back to the University of California, twice to pursue research on extreme ultraviolet physics and once to write a textbook. This as yet unpublished work is entitled Working Manual of Observational Astronomy. Both Buffalo State and the University of California are using the text in draft form.

On July 15, 1975, the U.S. and U.S.S.R. launched the Apollo - Soyuz Joint Test Space Project from Cape Canaveral. Twenty-seven science experiments were scheduled for the flight. A group from the



University of California, which had an experiment aboard the Apollo, hired Jack to work on the support for the experiment which attempted to see ultraviolet radiation across space, which up to then had been thought to be opaque to such rays, and also to measure the properties of detectors which would be used in future experiments.

In the college year, 1977-78, Dr. Mack was promoted to an associate professor at SUCB, and in May of 1979 he was honored by receiving the Chancellor's Award for Excellence in Teaching, the only professor on campus to receive this accolade in 1979.

Jack has written 24 articles which have appeared in such journals as: Astrophysics and Space Science, Astronomical Journal, Applied Optics, Nature, and the Buffalo Museum's Collections. He has received over 250 citations (literature citations) for works which he has authored or co-authored.

He is a member of the American Physical Science Society, the American Astronomical Society, is president of Buff. State's chapter of Sigma Xi, national scientific research society; and is a research associate of the Buffalo Museum of Science.

Jack has given innumerable lectures, state-wide, on topics including: black holes, the missing mass, various other aspects of cosmology, and on lighter veined subjects like astrology, UFO's and his delightful whimsey on dinosaurs. He has been interviewed from time to time on astronomical subjects, and has also appeared on television.

He is an avid reader and peruses many books and journals related to his profession, but for relaxation from the realm of astrophysics, Jack reads the popular science works of Isaac Asimov and George Gamow. He also enjoys science fiction, mysteries, the humor of P. G. Wodehouse, thrillers from the pen of Alistair MacLean, and the astounding number of creative efforts of Agatha Christie. He estimates that over a thousand books, mostly paperbacks, line the shelves in the library of his home.

Jack has a deep appreciation of fine music, and spends many hours listening to the works of noted composers from Bach, Beethoven and Brahms to Copland, Hanson and Grofe. He also tunes in to WNED's radio programs of excellent music. His record collection is indexed and cross-indexed according to composers, types of music, periods, and the like, with special indexing for his harp collection. He admits that his indexing system is not logical, but it does work.

Of great interest and concern to Jack is the rebuilding of the fire-damaged Planetarium at State. One of the programs, a historical presentation by Dr. Mack dealing with the measurement of star distances, is a writing achievement. It is hoped that it survived the fire unscathed.

SUCB is soon to be the possessor of a 16" Ealing Educator telescope, no longer in production, as the unusual result of a student transferring to Buff. State. The college from whence he came had this telescope from which the main drive and gear had been stolen. In addition, their astronomer had passed away, so the program had become defunct. Jack, finding that the college had no way of repairing their telescope, and realizing that he could count on excellent help from the B.A.A. in refurbishing it, arranged for an exchange whereby State received the telescope and the donor college received a number of small telescopes and numerous astronomical slides. In addition, Jack conducted a faculty workshop on teaching an introductory course in astronomy, thus enabling that college to reinstate its astronomy program. Bob Mayer is at work cutting a new gear for the telescope which will be ready in about a year. At present, decision



is being made as to the location of the telescope on the campus.

In his travels, Jack has been to England and Europe, Central and South America. He has also covered about half of the United States.

On Hunters Lane in Williamsville is the beautiful abode of the Mack family. Jack built their house with the help of his father, who came out of his four year retirement to aid in its construction. The house was designed by Mr. Mack Sr., and was built by father and son. In this very attractive home, Jack has provided a room for his pool table, where he enjoys a game when time permits.

He takes great pleasure in flower gardening, and has planted from 50 to 100 types of perennials on the grounds. One will find a few vegetables tucked in here and there behind his choice flowers. The coming of spring will bring an array of colorful blooms bursting forth from the 300 bulbs which he planted this fall.

Jayne and Jack have a lovely, happy two year old daughter, Alice Virginia, who is a great joy to her parents. In her ability to form complete sentences, she is unusually precocious.

Dr. Mack is a very capable, brilliant, sincere gentleman with an unfaltering vitality and a delightful sense of humor. He is a devoted husband and loving father, and is deeply admired by his students and many friends. He is the Buffalo Museum of Science representative on our Board of Directors, and it is a privilege to have him as a member of the B.A.A.

#### NOVEMBER CONSTELLATION

A large but inconspicuous constellation in the northern skies is Camelopardalis. It is bounded on the north by the Little Bear, on the east by the King and Queen, on the south by the Lynx, the Charioteer and the Hero, Perseus; finally on the West by the Great Bear and The Dragon. There are only five stars in this constellation greater than fifth magnitude. Not too many objects of interest are within its boundaries, although there are a few double stars and variable stars:- sigma<sup>1694</sup> at RA 12h 48' dec. 63° 17', 19 at RA 05h 32' dec 64° 07' and 67 at RA 03h 53' dec 60° 58', are the doubles. V at RA 03h 37' dec. 62° 29' - T at RA 04h 35' dec. 66° 03' - X at RA 04h 39' dec. 75° 00' - VX at RA 07h 21' dec. 82° 31' and R at RA 14h 21' dec. 84° 04'

#### DECEMBER CONSTELLATION

A small but interesting constellation is Lepus bounded on the north by Orion, on the south by Columba, on the east by Eridanus, and on the west by Canis Major. Objects of interest include doubles Beta at RA 05h 26' dec. -20° 48' - Kappa at RA 05h 11' dec. -13° and Gamma at RA 05h 42' dec. -22° 28' as well as variables T at RA 05h 03' dec. -21° 58' and "Hind's Crimson Star" (R) at RA 04h 57' dec. -14° 53'. NGC 1904 (M-79) is located in this constellation at RA 05h 22' dec. -24° 34'

#### METEOR SHOWERS

November	3rd	- Taurids (Southern)	RA 03h 40' dec.- 15° N.
	10th	- Taurids (Northern)	RA 03h 48' dec.- 22° N.
	11th	- Mu Pegasids	RA 22h 20' dec. 21° N.
	12th	- Arietids	RA 02h 00' dec. 20° N.
	14th	- Beilids	RA 01h 36' dec. 44° N.
	16th	- Leonids	RA 10h 00' dec. 22° N.



28th - Andromedes RA 01h 40' dec. 45° N.  
December 5th - Phoenicids RA 01h 00' dec. 55° S.  
13th - Geminids RA 07h 32' dec. 32° N.  
22nd - Ursids RA 14h 21' dec. 80° N.

SKY TEST - The Celestron C90 Astro Telescope Lawrence M. Carlino

Owning an ultra-portable yet superb-performing catadioptric telescope of small aperture has long been the dream of many an amateur astronomer. Unfortunately, the prohibitive cost of such luminaries as the Questar has restricted ownership to the fortunate few - that is, until the advent of the Celestron 90 Maksutov-Cassegrainian.

With a clear aperture of some 90mm. (3.55 in.), the C90 weighs in at only eight pounds including its single-fork mount with integral clock drive and slow-motion controls on both axes. The whole assembly fits neatly into a compact carrying case, except for the optional wedge which is needed to tilt the 'scope into its equatorial configuration.

Mechanically, the C90 performs well in most respects: the drive is smooth and accurate, and the slow-motions track with adequate precision. The RA clamp is a bit "grabby," but is acceptable once one becomes accustomed to it. The proximity of the 5x24 finderscope to the main tube makes it somewhat difficult to look through in certain orientations, and an aftermarket right angle attachment might be worthwhile in preventing a bruised nose or cheekbone. One shortcoming I cannot forgive, however, is the C90's focussing mechanism; the entire front section of the telescope tube rotates in a manner similar to that of a photographic telephoto lens. The movement is relatively smooth, but the stiffness increases markedly in cold weather, and obtaining sharp high-power focus requires patience and a steady hand. A focussing knob at the back of the instrument such as the one used on the Celestron 5 and 8 would be a good deal more satisfactory.

As to the C90's optical performance, I had not really expected to obtain the superb definition of the much more expensive Questar and Quantum catadioptrics - and my expectations turned out to be accurate. The C90's f/11 optical system does reach the theoretical limits where double star resolution is concerned. The difficult Castor is nicely resolved as are Epsilon Lyrae and close test double Pi Aquilae. Some residual color is at times discernible in the first diffraction ring, but the image quality is certainly acceptable. Deep-sky objects show surprisingly well through the C90, its fully baffled optics yielding a dark field which permits good resolution of globular clusters M13 and M22 and provides striking views of the Lagoon and Omega nebulae (M8 and M17 respectively) under dark sky conditions. Sweeping the Milky Way with a low power 1¼-inch Erfle eyepiece (.97 inch eyepieces are standard) turns the 'scope into a competent RFT.

All of this does sound like rather impressive performance, the small aperture and size of the C90 notwithstanding. Yet, there is one aspect of the instrument's prowess that ranks as a disappointment. Lunar and planetary images, enigmatically perhaps, appear sharp and well-defined at medium and high magnifications, but they somehow lack the image contrast necessary for the viewing of minute and delicate detail. Jupiter, for instance, reveals the major belts, zones, and Great Red Spot; but the detail has a "washed out" look to it. Saturn, even when observed under excellent seeing conditions, shows a clean ring system with the Cassini Division, but not much else. This is not to say that the C90 gives a poor image; its quality is



commensurate with its low price, and one should not expect performance on an absolute par with the vastly more expensive Questar or a first-rate refractor. For a retail price of \$495 (considerably less if one shops the dealer ads found in Sky & Telescope and Astronomy) the C90 seems an excellent value for the beginning astronomer and the perfect instrument for the enthusiast who requires the utmost in portability. There is simply no other telescope in its class.

Perhaps one final word is in order. When my C90 originally arrived, it suffered from a peculiar (and probably unique case of) corrector lens thermal distortion and poor images when used in cold winter weather. When apprised of the problem, Celestron International immediately set to work to find the cause of the problem and did not cease until the instrument was restored to its full potential and returned to me. They were most accommodating in all our contacts and were highly concerned with providing the best product and service possible. Such a corporate philosophy is altogether too rare these days, and Celestron must therefore be highly commended on their exceptionally fine attitude.

#### INSTRUMENT SECTION MEETINGS

Ken Kimble

The instrument section meets on the fourth Friday of the month. It is held in the Science Museum on Humboldt Pkwy. This is the place to learn the techniques in building telescopes for both beginners and experienced. Ideas are passed around on how others have made their instruments, or damaged them.

#### STUDY SECTION MEETINGS

Ken Kimble

The topic of discussion for the November meeting of the study group will be Galaxies. Members will each research a small phase of this general subject and report to the group. We will not meet in December due to the Christmas rush. We will meet again in January when John Raymonda will lead a discussion on Spectroscopy. The Study Group meets in Dr. Price's 2nd floor classroom at Buffalo State at 8:00 P.M. the third Friday of each month. All those interested are invited to attend. See you there.

#### ASTRONOMICAL TECHNIQUES - A Book Review -

Kenneth Kimble

I wonder how often the following sort of sentence appears in a book or periodical. "This spectra was obtained with the Coude Spectrograph at..." A Coude Spectrograph!! What's that?

I recently came across a book at the downtown branch of the Erie County Library that has managed to shed some light on situations such as this. It's not a new book either with a copyright date of 1962.

The name of the book is ASTRONOMICAL TECHNIQUES. It was edited by William Hiltner and has a long list of contributors. It is volume two of a nine volume series on astronomy entitled STARS AND STELLAR SYSTEMS. The general editor of the series, by the way, was the late Gerard P. Kuiper, an astronomer of exceptional note.

ASTRONOMICAL TECHNIQUES is a collection of independent articles accompanied by many drawings and a few photographs of most of the auxiliary equipment one might find in a large observatory. Included are Photoelectric Photometers, Image Convertors and Television Equipment, Spectroscopes, Polarimeters and various other equipment. Also included are several sections detailing how acquired data are reduced to useable information.



The book is of a technical nature, but I feel that a great deal of information can be gleaned from it appropriate to ones own knowledge or background even if to just examine the photographs and drawings.

I think it is a book worth looking over. I find sometimes that even those educated enough to grasp information passed on to them in books and magazines are ignorant (myself included) of methods used to obtain that information. So here is a chance to eliminate at least some of that ignorance.

In closing, I would like to note that the downtown Buffalo Branch of the library has a comprehensive selection of books on astronomy and astronomy related subjects such as optics and physics plus an assortment of periodicals on same.

#### ANSWERS TO THE QUIZ

#1- The side away from the Sun.

#2- This effect shows strong local electric fields which can split energy levels, so that averaged out over the surface of a star the resultant splitting of lines is smeared into a line-broadening effect. It is generally only noted for hydrogen and helium lines.

#3- Radio, Radar, Infra-Red, Ultra-Violet, and X-Ray Astronomy and others.

The Buffalo Astronomical Assn., Inc.  
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#### FIRST CLASS