San Francisco Amateur Astronomers

c/o Josephine D. Randall Museum
199 Museum Way, San Francisco 94114

President:	Irving Hochman	641-0770
Vice President:	Bob Levenson	468-3592
Secretary/Treasurer:	Chelle Beard	878-4965
AANC Representative:	Nancy Cox	826-2217
Bulletin Editor:	Jim Shields	585-4088

BULLETIN FOR MAY 1989

Date: WEDNESDAY, MAY 17

Time: 8:00 P. M.

Place: Auditorium, J. D. Randall Museum

Topic: "A COSMIC BOOK"

Speaker: Dr. Joseph Silk
Professor of Astronomy, UC-Berkeley

Dr. Silk is Professor of Astronomy at the University of California-Berkeley. He studied at Cambridge University and earned his Ph.D. at Harvard University.

He has published extensively in technical journals and is the author of "THE BIG BANG: The Creation of The Universe", the new edition of which has just been published.

In "A Cosmic Book" Dr. Silk collaborated with Dr. Phillip J. E. Peebles of Princeton University, in a tongue-in-cheek assessment of the odds concerning the leading cosmological theories. This assessment, or "book", was published October 1988, in the British journal "Nature".

ADIEU TO A FRIEND

We are saddened to learn belatedly of the recent death on January 20, of Fr. Richard Spohn, S. J.

The 75-year old retired educator, considered the "Mr. Wizard" of physics at St. Ignatius High School, is fondly remembered, not only by legions of students and colleagues, but also by many members of the San Francisco Amateur Astronomers.

Fr. Spohn had on many occasions over the years shared with us his great enthusiasm and knowledge, when he was our featured speaker on such topics as "Tides" and "Stonehenge".

He will be missed for his good humor and keen wit, which were exceeded only by his warm and exuberant personality. I.H.

ASTRONOMY DAY - May 13

On Saturday, May 13, we will all participate in Astronomy Day observances at Cliff House on Ocean Beach. From 1 - 5 p.m. we will have sun telescopes for public viewing, and from 7 - 11 p.m. a variety of telescopes for evening observing of the night sky. Everyone is invited to come and help show and explain to the public what it is that we find so enthralling up there. You'll enjoy doing it. Bring a friend!

ASP CENTENNIAL MEETING

The ASP Centennial Meeting will take place starting June 21 through June 25 at the University of California-Berkeley. The ASP is seeking volunteers to help staff information tables, among other things. Volunteers will be able to attend some of the lectures at no cost. If you can help out, call Andy Fraknoi at 337-1100.

OPEN HOUSE AT FREMONT PEAK

All amateur astronomers in Northern California are invited to a special pre-season observing session reserved just for them at the Fremont Peak Observatory on Saturday, May 6. The 30" telescope will be open from sunset on. For more information, call (415) 654-6796 in Oakland or (408) 623-4255 at Fremont Peak.

STAR PARTY UPDATE

Unfortunately, the April 1st star party joined those of February and March in oblivion. But I am assured by the stellar oracles that May 6th is an auspicious date for stargazing, in terms of sky and weather. So let's hold the right thoughts and look forward confidently and avidly to a rewarding evening on Mt. Tam.

We expect to have three groups of guests joining our regulars. The students of Marin's Waldorf School and San Francisco's Presidio Middle School, who were scheduled to join us the past three months, are going to give the elements another chance. We will also host a sizable group of visiting psychiatrists who are attending the American Psychiatric Association convention in San Francisco.

Our members are turning out in force for this special event. To accommodate our guests, there will be everything from 3" refractors to 16" reflectors, with lots in between. We urge you all to come and join the party. The telescopes will be trained on some of the most interesting objects to be seen in the sky. If you haven't been to a star party lately, it's a great opportunity to see a wonderful line-up of planets, clusters, galaxies and nebulae in a variety of telescopes. Bring your own, if you have one or even just a pair of binoculars. As you know, it's at Rock Springs near the Mountain Theater.

Come at about 7:30 to set up, watch the sunset, socialize and enjoy a Heavenly treat. I.H.

DO YOU KNOW THE WAY TO FIDDLETOWN ?

If you're interested in observing galaxies and nebulae at their very best, you should plan on visiting the club's observing site near Fiddletown in the Gold Country sometime this summer. It's about a three hours' drive from the City, but well worth it.

Starparties at Fiddletown have been informally scheduled for the following Saturdays during the summer months:

May 6 June 3 July 8
August 5 September 2

During the summer Fiddletown "regulars" often drive up on Friday and spend the weekend. There's plenty of time before sunset for a barbecue and debate on cosmology.

The Fiddletown observing site is available to SFAA members thanks to the generosity of Bob Kestner, the owner of the property. Bob asks that, on your first visit there, you be the personal guest of a club member that he already knows. Please call Jim Shields at 585-4088 or Steve Gottlieb at 525-7968 a week or so in advance of your first visit; they can tell you how to get there. J.S.

MAY EVENTS!

4 - Eta Aquarid meteors. With no moon in the sky, this should be an exciting spectacle. Expect to see between 10 and 40 meteors an hour in the pre-dawn hours, May 4 - 6, near the "Water Jar" in Aquarius.
Moon at perigee (223,560 miles from Earth)
Pluto at opposition. Closest approach to Earth in ages and as bright as it ever gets, 13.6 mag. Use 8" or larger, (see Astronomy, May issue, p. 65)
Jupiter 5° north of Aldebaran.

5 - New Moon.
Eta Aquarid meteors, best before dawn.
Mercury provides best apparition of year on the first 10 evenings in May. Look below and to the right of Jupiter in the evening twilight.
Alan Shepard, first American in space, 1961.

6 - SFAA Star Party. (See 'Star Party Update')
Look for grouping of Moon, Mercury and Jupiter.

7 - Jupiter 5° south of Moon.

8 - Mars 3° south of Moon.

12- First Quarter Moon.
Mercury stationary.
Juno 0.4° south of Moon, occultation.

13- Astronomy Day - SFAA telescopes at Cliff House.
Regulus 0.4° north of Moon, occultation.

14- Vesta stationary.
Skylab launched, 1973.

16- Mercury 0.6° north of Venus. This month Venus returns to the evening sky, low in the west-northwest, just after sunset.
Moon at apogee (251,882 miles from Earth)

17- SFAA general meeting. Dr. Joseph Silk, guest speaker.

20- Full Moon.

21- Antares 0.4° north of Moon, occultation.

23- Venus 0.8° north of Jupiter.
Mercury in inferior conjunction.

24- Saturn 4° north of Moon.

28- Last Quarter Moon.

30- Pallas 0.7° south of Moon, occultation.

GONE IN A FLASH (but not forgotten) - by Irving Hochman

Usually, when someone asks me if anything exciting is happening, I understand them to mean something "important" like a lottery windfall, a tax refund , a romantic encounter or the like. Well, my standard answer, unfortunately, has been a triple negative;- until the evening of April 3rd, that is, when my luck changed dazzlingly! No, I didn't come into any money, but I did experience a flash-- no, not a hot flash but a breathtaking GREEN FLASH!

The setting was romantic enough - the rugged, beautiful coastline at Point Arena, about 35 miles south of Mendocino, where I spent 5 days with friends in a rental home at the Pt. Arena lighthouse. The weather was perfect - warm, clear, dry, with gentle breezes and a quiet ocean, except for a spectacular crashing surf. We had spent the day bird-watching in the area and after dinner we walked out to the point where the lighthouse is. We sat on the fence and watched the Sun setting across the ocean. I mentioned to them the possibility of seeing the green flash without really expecting it to happen. As we watched, the Sun's disk lowered and became distorted and bent by the atmosphere until it was no more than a flattened red arc. Just before it disappeared there was a momentary pulse of bright green across the vanishing arc. Talk about excitement - we whooped and hollered and I fell off the fence.

In Scottish legend, the green flash is said to banish all errors in matters of the heart of the viewer fortunate enough to observe it. We'll see.

SPANNING THE SOLAR SYSTEM

The first ten days in May offers an unusual chance to observe the nearest and(ordinarily)the furthest planets from the Sun on the same evening. Mercury isn't hard to find, if you know when and where to look. Half an hour after sunset, sweep the sky 15° above and north (right) of where the Sun set. Mercury will be the northernmost bright "star" in a triangle made up of Jupiter and Aldebaron in the constellation of Taurus.

Mercury is very bright - around first magnitude - and should be visible naked-eye even from your backyard in the City, if you have a clear western horizon. In contrast, even though Pluto is about as bright and close to Earth as it ever gets, it is still around 60,000 times fainter than Mercury! So it will be a bit harder to locate and identify. You'll need a good dark sky, at least an 8" telescope and some persistence.

The current issue of Astronomy includes helpful observing tips and finder charts for both planets. If you're successful in observing either or both, drop a line to the Bulletin Editor so we can all share your experience. J.S.

A HISTORY OF GALAXY CATALOGUES - by Steve Gottlieb

In October 1783 William Hershel began his sweeps for nebulae and ushered in a new era in observational astronomy. Up to that time a total of 137 nebulae and clusters of stars had been catalogued. Of these, 40 were discovered by Messier and 28 by Mechain. In addition, during an expedition to the Cape of Good Hope in 1751-1753, Lacaille discovered 24 southern deep sky objects, including 21 gems which Messier did not include in his famous catalogue because they were unobservable from Paris. These early discoveries were generally accidental, found during comet sweeps or in cataloguing stars.

When William Hershel completed sweep number 112 almost twenty years later, on December 30, 1802, he had discovered nearly 2,500 deep sky objects, increasing the known total by 1,800 percent! His catalogues appeared in the Philosophical Transactions of the Royal Astronomical Society in 1786, 1789 and 1802. William divided his discovered into eight classes:

bright nebulae	faint nebulae
very faint nebulae	planetary nebulae
very large nebulae	very compressed clusters of stars
coarsely scattered clusters	pretty much compressed clusters

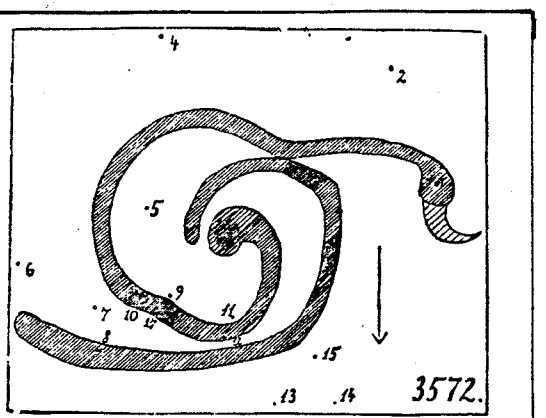
In addition, he introduced the notational abbreviations which are still found today in Burnham's Celestial Handbook. Most of the discoveries were made with William's favorite telescope: a 20-foot focal length reflector of 18.5" aperture.

Between 1825 and 1833 John Hershel continued in his father's footsteps, adding 500 new objects with the same reflector. These discoveries appeared in the Philosophical Transactions of 1833 and became known as the "Slough Catalogue". Objects are listed in order of right ascension and positions given for epoch 1830. Then, between 1834 and 1838, John travelled to the Cape of Good Hope and discovered a full 1,700 new southern nebulae in addition to the numerous clusters and nebulosities associated with the Magellanic Clouds. The first great comprehensive catalogue was the General Catalogue of Nebulae and Clusters of Stars (called the "GC") compiled by John Hershel in 1864. It contained 5,079 entries mostly discovered by his father and himself.

During the next 20 years well over 1,000 new deep sky objects were found, many using the tremendous 72" (that's aperture, folks!) reflector of the Earl of Rosse at Parsontown. Many of the discoveries were of faint companions of objects originally discovered by the Hershels. Lord Rosse published his additions to the General Catalogue in the Transactions of the Royal Irish Academy in 1878. Eyepiece sketches are included that show an amazing amount of spiral structure in many galaxies.

I've found many of these early catalogues a treasure chest of fascinating information. Although the catalogues themselves are long out of print, I've photocopied several of them from the UC Berkeley Graduate Library to compare with my own observing notes and to help identify deep sky objects with ambiguous positions.

The excerpt below from Lord Rosse's catalog shows an eyepiece sketch of the Whirlpool Galaxy (M51), together with observing notes from 1875-77:



1875, Apr. 28. Viewed through and between clouds. Lord Rosse thought the *front-view* showed the knots and F parts better than he had seen it with the telescope in Newtonian mounting.
1875, May 1. (Newton.) Sky not very good, still I think it beyond doubt that the front-view the other night was superior.
1877, May 6. (Speculum newly polished). Nucl n is very excentric, great mass of neby north of it, and after looking at it for some time I saw consid. amorphous masses p it, while the space between n and the nearest convolution is entirely free from neby. The left handed spiral (v F) starts from the nf end of Nucl n.—The first convolution is v F, the second one was traced very near N on s side. A little p the line Nn the 2nd convol. is suddenly v F, but immediately afterwards it has a B knot. The turn of the 2nd convol. f the line Nn ["the elbow"] is not square but nearly R.—At * 12 the first convol. becomes ps B; I am nearly sure that the southernmost convol. is a simple continuation of it; p N the 1st convol. runs for a short dist. nearly straight p f. It starts from the f side of N and becomes almost immediately v F.

Because of the many new discoveries and the many inaccurate positions found in the General Catalogue, John Dreyer, an assistant to Lord Rosse, was commissioned by the Royal Astronomical Society to compile the New General Catalogue of Nebulae and Clusters of Stars (NGC) in 1888. This catalogue contains 7,840 entries and has remained for 100 years as the principal designation system for the deep sky objects it contains. It is the last great catalogue of objects discovered visually.

Hence it is still a remarkable reference source for today's amateurs, who can now search out all of these objects using the new Uranometria 2000. Although many NGC objects were discovered with William Lassell's 48" equatorial or Lord Rosse's 72" leviathon, I have found from observing nearly 3,000 NGC objects that virtually all are visible in a 17.5" scope from a dark site, if accurate finder charts are prepared. Still, the correct identification of the faintest objects is often difficult or impossible because of imprecise positions and other errors in the NGC.

By 1894 Dreyer published the first Index Catalogue of Nebulae Found in the Years 1888 to 1984 (known as IC I) containing 1,529 new objects. This catalogue includes the first photographic discoveries, as well as corrected information on many NGC entries. Finally, the Second Index Catalogue of Nebulae and Clusters of Stars (IC II) of 1908 added 3,857 objects, mostly discovered photographically and including objects down to a limiting magnitude of 17th.

Harlow Shapley and Adelaide Ames produced the first important modern catalogue of galaxies, A Survey of the External Galaxies Brighter than the 13th Magnitude, in 1932. This list of 1,249 galaxies gives photographic magnitudes, diameters and Hubble types. As such, it forms the basis for the galaxy listings and data found in Burnham's Celestial Handbook. An update of this catalogue entitled A Revised Shapley-Ames Catalog of Bright Galaxies, published by A. Sandage and G.A. Tammann in 1981, gives recent photometric data as well as many photographs of the various Hubble types.

A more extensive work is the Reference Catalogue of Bright Galaxies (1964) by Gerard and Antoinette de Vaucouleurs. This catalogue extends the Shapley-Ames survey to 2,599 entries, many of which do not appear in the NGC or Index Catalogues. The work was updated in 1976 as the Second Reference Catalogue of Bright Galaxies and contains detailed information on surface brightnesses, color indices, classification types and radial velocities of 4,364 systems. This is a standard reference source for professional astronomers and forms the data base for the galaxy listings in Sky Catalogue 2000., Volume II.

The Palomar Observatory Sky Survey (POSS) was completed in 1956, using the 48" Schmidt telescope, and forms the basis for three major galaxy catalogues. From the wide-field photographic survey down to 33° south declination came the Morphological Catalogue of Galaxies (MCG), compiled by B.E. Voroncov-Vel'jaminov in Moscow. A total of 29,000 galaxies down to 15th magnitude appear in the four-volume work.

My most useful reference catalogue has been the Uppsala General Catalog of Galaxies (1973) by Peter Nilson, which contains information on 12,921 galaxies larger than one arcminute in diameter. The catalogue contains diameters, position angles, magnitudes and extensive descriptive information based on the POSS. It is cross-referenced to the NGC, IC and MGC.

Finally, a most impressive work is the six-volume Catalogue of Galaxies and Clusters of Galaxies (CGCG), compiled by Fritz Zwicky and co-workers and published at Cal Tech in Pasadena between 1961 and 1968. It lists epoch 1950. positions and photographic magnitudes of 31,350 galaxies down to magnitude 15.7, as well as 9,700 clusters of galaxies. I find it very helpful that all of the listed galaxies and some brighter reference stars are accurately plotted on finder charts, each covering one of the 559 fields from the POSS.

If you're interested in examining any of the older visual or newer photographic catalogues discussed herein, give me a call at 525-7968 and I can bring it along to the next club meeting.

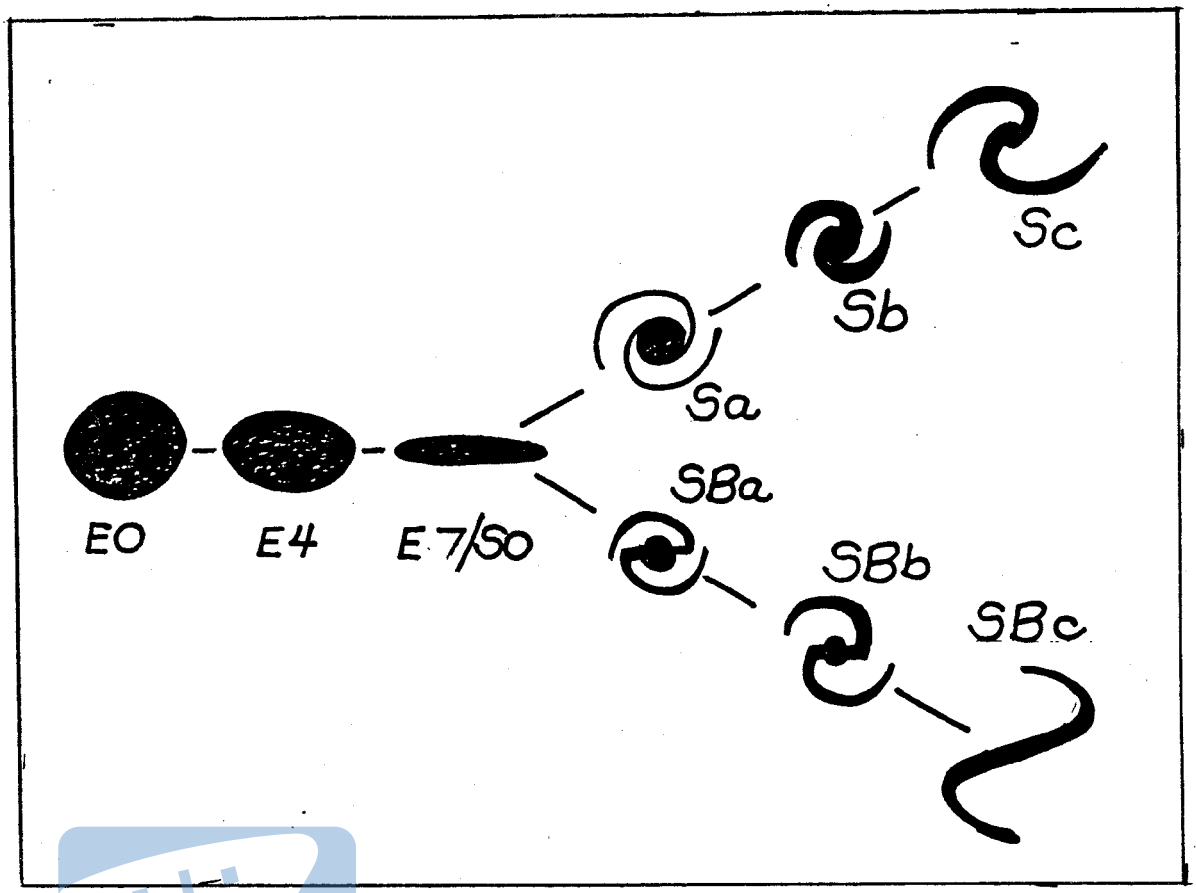
SFAA MEMBERSHIP BENEFITS

Membership dues of $15 per year include the monthly SFAA Bulletin and free admission to all club activities such as lecture meetings, star parties, summer picnics, etc. In addition, you may obtain subscriptions to Sky & Telescope, Astronomy, Deep Sky and Telescope-Making magazines at greatly reduced rates. For more information please contact Chelle Beard, 32 Penhurst Avenue, Daly City 94015. Telephone: 878-4965 evenings. Renewing members are asked to contact Chelle before sending in their fees if they haven't received a renewal letter from her.

GALAXIES GALORE - by Jim Shields (with title courtesy of Lisa Puls)

Classification is the first step in understanding. By noting similarities in different objects, and differences in similar objects, we introduce order into our study of nature. This is true for galaxies, just as it is for plants and animals. Amateurs can deepen their understanding of the universe if they understand something about galaxy evolution and morphology, the study of galactic form and structure.

In the 1920's Edwin Hubble devised a classification scheme for the "spiral nebulae", then recently discovered to be "island universes" outside of the Milky Way. He began to elaborate and illustrate his system in the Hubble Atlas of Galaxies, edited and completed after his death by Allan Sandage. Albeit much refined, Hubble's system is still in general use today. It is best illustrated by his famous "tuning fork" diagram:



Hubble types in this article are from Sky Catalog 2000. (unless otherwise noted), which often differ from the Hubble Atlas. The differences are usual not great and illustrate the fluid nature of transitions between the various types. Many galaxies do not fit neatly into a specific category. My own observations were mostly made from Fiddletown using a 17.5" Dobsonian and a 9mm Nagler eyepiece (222X). How much can you see in your own telescope?

GALAXY EVOLUTION

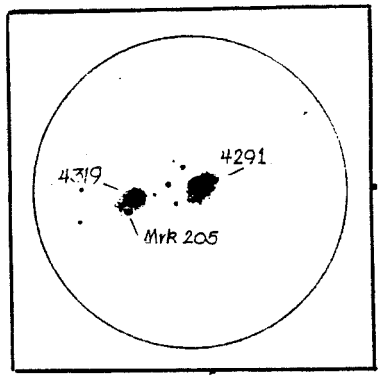
Hubble thought that galaxies might evolve from left to right along his tuning fork; that is, an elliptical (E) galaxy might change with increased age into a regular (S) or barred (SB) spiral. Sandage speculates in the Hubble Atlas that the evolutionary sequence might run the other way. Neither idea is commonly accepted today.

Instead, it is thought that the type of a galaxy depends upon the initial conditions; that is, the mass and rotational velocity of the proto-galaxy or collapsing cloud of gas and dust out of which the galaxy was formed. The idea is similar to the (better-founded) theory of stellar evolution, under which the type of a particular star is largely determined by its initial mass and by its age.

The fact that stellar evolution is understood quite well, while theories of galaxy evolution are still in their infancy, is comprehensible. It is believed that the nearby galaxies that make up most of our observable universe were formed at more or less the same time (within the first billion years or so after the "Big Bang") and are thus of more or less the same age. Unlike stars, new galaxies are not being formed around us today because the expansion of the universe has diluted the distribution of gas to an extent such that large-scale gravitational collapse no longer takes place.

To observe younger galaxies, we must look ever further out into space and thus ever further back into time. If there is an evolutionary sequence for galaxies, it most likely runs, not between the various Hubble types, but between the nearby galaxies and the "fuzzy" quasars and large redshift proto-galaxies that we are just beginning to discover and understand.

Examples of possible earlier stages in galaxy evolution are not difficult to observe in many amateur telescopes. The brightest quasar, 3C273 in Virgo, shines at 13th magnitude but is a challenge to identify. Another quasar, Markarian 205, is harder to see (mag 14.5) but easier to find. It lies right next to NGC 4319, a 12th magnitude SBb galaxy in Draco. Mark 205 is especially interesting because Halton Arp believes that the quasar is connected by a gas bridge to the galaxy of much lower redshift.



Certain galaxies with very compact bright nuclei (known as "Seyferts") may represent an evolutionary "missing link" between the quasars and the "normal" galaxies around us. The brightest example is M77, a 10th magnitude Sb spiral in Cetus. Almost as bright is NGC 4151, an Sb spiral in Canes Venatici. Both galaxies contain bright, almost stellar nuclei. NGC 4151 has an apparent companion (NGC 4156) of substantially higher redshift.

ELLIPTICALS

Elliptical galaxies do not contain the flattened disc of stars and gas that is typical of other types. Ordinarily, they are composed of old stars and do not

contain much gas and dust out of which new stars might be formed.

Ellipticals are classified according to their apparent flattening across our line of sight, based upon the formula E__ = 10 (a-b/a) where "a" is the major and "b" the minor axis of the galaxy. Thus, an elliptical galaxy that is perfectly round (a=b) would be classified as E0; one with a major axis twice that of its minor axis (a=2b) as E5; and so on.

The Andromeda Galaxy (M31) has four bright companions that illustrate the varying degrees of elongation among ellipticals. Of course, M32 and NGC 205 (also known as M110) lie within the same low power field as M31 itself. M32 appears quite round visually and it is no surprise that it is classified as E2. In contrast, NGC 205 appears greatly elongated, with a major axis perhaps three times that of its minor axis. A little simple mathematics yields a type of E7 or thereabouts. In fact, the galaxy is classified as E6.

Two other companions of M31, NGC 147 and 185, lie about seven degrees north of M31 within a degree of each other. Through the eyepiece NGC 147 is noticeably more elongated than NGC 185. My own estimates are: for NGC 185 a= 1.25b; for NGC 147 a=2b. This yields classifications of dE2 and dE5, respectively, consistent with those shown in Sky Catalog 2000.

NGC 147 and 185 are classified as dwarf ellipticals. Such dwarfs are usually very difficult to observe because of their small size and low surface brightness. Another example observable in large amateur telescopes is Leo I (UGC 5470), classified as dE3. In a 17.5" scope it appears as an elongated smattering of stars, only slightly more condensed than the stellar background.

The dominant galaxies in the Virgo Cluster are giant ellipticals with varying degrees of flatness, classified as follows:

M87 - E0 M84 - E1 M86 - E3 M49 - E4

M84 and M86 lie in the same eyepiece field. M84 appears quite round. Does M86 look elongated to you? Can you estimate its type by comparing its major and minor axes?

Lenticular (S0) galaxies are a transition type between ellipticals and spirals. Unlike ellipticals, they contain a flattened disc of stars which gives them a typical lens shape. Unlike spirals, this disc contains no internal (spiral arm) structure. In many cases, lenticulars appear to have been swept clean of their remaining gas and dust.

Two of the brighter S0's, NGC 3115 in Sextans (known as "the Spindle") and NGC 5866 in Draco (sometimes known as M102), are highly inclined to our line of sight, but do present the lens shape typical of this type. (As befits transition types, both galaxies are classified as E6 rather than S0 in Sky Catalog 2000.)

(Coming next month: spirals, barred spirals and irregulars)

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CLASSIFIED ADS

Members' ads are free and will run three times. Please notify the Bulletin editor if an item is sold so the ad may be deleted. This service is provided monthly on a space-available basis.

FOR SALE: 17½" Dobsonian and 10" Meade DS10 with eyepieces. Call Toney 668-9691 after 6 pm until midnight. (3)

FOR SALE: Sony Stereo Cassette Recorder - TCS 430 - with microphone and headset. Brand new, never used. $75 or best offer. Call 731-9020. (2)

FOR SALE: 16mm Type 2 Nagler. Used once - perfect condition. $215. Call Rick Decker at 383-6339 / 956-7070. (1)