East Valley Astronomy Club

May Newsletter 1994

EVAC HIGHLIGHTS

At the April 27th EVAC meeting, Tom Polakis started off the program with some interesting results from research he has been doing about sky clarity. Many observers probably ask "Just how clear are the skies in Arizona?" Often, it seems as though the night sky in Arizona doesn't quite measure up to its reputation. Tom's data came from Brian Skiff of Lowell Observatory, who has been collecting data on sky clarity at Flagstaff for many years. Tom showed that Flagstaff had about 140 clear nights per year on average. The best month was June and the worst months were during the spring and the summer monsoon. Generally, we can expect about 3-4 consecutive clear nights. Tom also compared the results to the observatories in Chile, which had over 250 clear nights per year.

The main speaker was Frank Kraljic, who discussed his science fair project, for which he received second place. His project dealt with the composition of asteroid 951 Gaspra. Frank used data returned from the Galileo satellite to determine the composition of the asteroid. First, he used an image processing program to determine the spectrum of selected areas on the asteroid. Galileo measured the spectrum in four wavelengths. After determining the spectrum of the selected areas, he compared these spectra to those of meteors and other asteroids for which the composition is known. Although Frank's results didn't quite agree with the "official" results, he did not have access to data from the infrared part of the spectrum. This proved to be the determining factor. Next year, Frank plans to continue this project and expand it to include data on asteroid Ida.

After his talk, Frank gave us a tutorial on the correct pronunciation and spelling of his last name. (*Editors' note: We sincerely apologize for the misspelling of Frank's name in the last newsletter. Now that we have been educated, we have no excuse for further blunders. Thanks Frank!*)

The Sentinel Stargaze, sponsored by the Saguaro Astronomy Club on Saturday, May 7th was a success, with at least 30 telescopes and 50 people attending the event. Unlike last year's Sentinel Stargaze, the weather cooperated this time. Participants were treated to dark skies and good views of deep sky objects.

On May 10th, several EVAC members gathered at Scottsdale Community College to view the eclipse. The skies were clear and at least 150 people looked at the deep partial eclipse. Other members sought various sites in southeastern Arizona, hoping to see the annular eclipse.

On May 14th, in lieu of the deep sky star party, we held a star party/farewell party for Leon and Fannie Knott. We had an excellent turnout, with about 45 people and at least a dozen scopes. A few high clouds early in the evening cleared off within a couple hours of sunset. The crescent moon was a favorite target in the early evening. Later in the evening the summer Milky Way rose and many observers turned to their favorite early summer objects.

MAY'S SPEAKER

This month we've decided to devote the entire evening to "show and tell". If you have slides or photos of the eclipse, the star party at Sentinel, or any other event, bring them to the meeting. We'll have a slide projector available. If you have a video to show, or need an overhead projector, call Don Wrigley a couple of days before the meeting so he can make the proper arrangements.

UPCOMING EVENTS

EVAC Business Meeting
May 25, SCC Room PS172, 7:30pm

Local Star Party
June 4, Florence Junction Site and Carefree Site

Deep Sky Star Party
June 11, Vekol Road Site

COMING CELESTIAL EVENTS

A solar eclipse is a tough act to follow, and the Shoemaker-Levi Jupiter collision isn't due till July, but that doesn't mean that June should not be an exciting month for observers. For one thing, it might be a good time for those people with larger telescopes to sight Shoemaker-Levi before it gets lost in Jupiter's glare. It might also be the best time to hunt down that most elusive of all planets—Pluto. See the May issue of Astronomy magazine for details. While you're at it, you might want to look for the asteroid Iris, which will be passing quite close to several globular clusters in Ophiuchus this June. Some of its positions for June are as follows:

Date	R.A.(2000)	Dec.
June 1	17h 15.2m	-23° 31'
June 6	17h 09.9m	-23° 17'
June 11	17h 04.6m	-23° 02'
June 16	16h 59.3m	-22° 46'
June 21	16h 54.2m	-22° 29'
June 26	16h 49.5m	-22° 13'

Look for it right next to NGC 6287, a ninth magnitude globular, on the night of June 11. The asteroid itself should also be shining at about ninth magnitude. Good hunting!

Our comet for the month is Tempel 1, which will be glowing at about ninth magnitude near Delta Virginis as the month begins. Its path throughout the month is relatively free of galaxies, so it should be easy to identify. Look for it at the following coordinates:

Date	R.A. (2000)	Dec.
June 1	13h 01.8m	+02° 12'
June 6	13h 05.5m	+00° 21'
June 11	13h 10.2m	-01° 35'
June 16	13h 16.0m	-03° 33'
June 21	13h 22.7m	-05° 33'
June 26	13h 30.2m	-07° 35'

EVAC OFFICERS

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A SAD FAREWELL TO LEON AND FANNIE

It is our sad duty to announce the upcoming departure of Leon and Fannie Knott from the East Valley. Their dedication to amateur astronomy, and their considerable contributions to the success of EVAC over the past two years deserves mention here. Leon was our Newsletter editor last year, and his entertaining and provocative style of writing set a standard that those who follow in his footsteps can only hope to achieve. We cannot even begin to recall how many times Leon and Fannie provided refreshments for the entire membership, at their own expense, for our business meetings. Their mirror making class was a huge success, largely due to the efforts and perseverance of both Leon and Fannie. Its impact will be felt for many years to come as more and more telescopes produced from that class come into use. Thanks to them, the large aperture telescope will no longer be a novelty in the East Valley. Leon's knowledge of observing is truly remarkable. He is always willing to share this knowledge freely with others and does so in a non-condescending manner. For these and many other reasons we owe them a great debt of thanks, and wish them the best of luck in the future.

FOR SALE

Celestron Powerstar C8-PEC, excellent condition. Scope includes: C8 tube assembly with Starbright enhanced coatings and Periodic Error Correction drive system, visual back and 1¼" diagonal, DEC motor, hand controller, 12V transformer, Deluxe Latitude Adjuster Kit, 8X50 illuminated Polaris Finder with quick-release bracket, Orion FlexiShield Dew Cap, Orion nylon Scope Saver telescope cover, piggyback camera mounting bracket, Losmandy Dual-Balance counterweight system, setting circle illuminators, storage/carrying case, instruction manual and homemade "Kwik Focus". $1,100 or best offer. Also for sale: 4.8mm Nagler, never used; $115 or best offer. Contact Jim at 893-0198 after 6pm or at 554-8789 8am-5pm.

Laminated SkyAtlas 2000 Field Edition (white stars on black background); $30. Contact Robert Kerwin at 945-8161.

The Observer
The Event of the Year?

by Tom Polakis

For six days in July, Jupiter will be more closely watched than at any other time in history. Observers from both the professional and amateur communities will be zeroing in on the giant planet to watch what may be the astronomical event of the year. From the 16th through the 22nd of July, Jupiter will be bombarded by fragments of Comet Shoemaker-Levy 9, possibly causing observable changes in the planet's cloud tops. It's not too early to begin lining up an observing program for the big event.

Conditions are not ideal for observing the event, but they could be much worse. Fortunately, the impacts aren't happening at a time when Jupiter is behind the Sun. A recent example of bad luck happened when an entire cloud belt disappeared from the planet during conjunction, only to reappear during the next conjunction, a year later. Both events were lost in the solar glare. In mid-July, however, Jupiter will be near quadrature, just past the meridian after sunset. Although it will be located south of the celestial equator among the stars of Libra, it will be reasonably well up in the sky for a three hour observing window. Jupiter's altitude will be nearly 40° when it becomes visible after sunset.

For Arizonans, the downside is that the summer monsoon should be in full bloom by July 16. We can look forward to sweltering in the high evening temperatures, fighting off bugs that have recently found a new lease on life. If it is actually clear, we'll be able to read our charts by the light of nearby bolts of lightning. Don't expect to use your 3mm eyepiece with a 3x Barlow lens during a time of year known for turbulent air. Let's hope for just poor seeing as that would be an improvement over the season's typically terrible seeing.

If you're going to be looking for extremely subtle changes in the Jovian atmosphere, it is best to get familiar with the planet beforehand. Even the smallest scopes will show some atmospheric detail. My first view ever of Jupiter was through a Selsi Optics 4-inch reflector, in 1977. At 30x, with a poorly figured mirror, I could see an "equals symbol" of the two major cloud belts. Any modern instrument can do at least this well. If you have a telescope resting in a closet, now is the time to start using it!

The next level of detail after the two equatorial cloud belts involves the Great Red Spot and other cloud belts. The Great Red Spot is currently showing a pale pink hue. It is embedded in the South Equatorial Belt. Several other belts and zones should be visible on good nights. A gray 'hood' often covers the Northern hemisphere of the planet from the pole down to 60 degrees latitude or so.

With some real good luck, we'll be treated to steady air that will allow us to see the delicate festoons that are so often mentioned in the literature. One of my best views of Jupiter came during the 1993 Sentinel Star Gaze, through a 13-inch scope owned by Rich Walker. The cloud belts were filled with tiny knots and filamentary cloud detail. Even the Great Red Spot even showed some internal detail. All four Galilean satellites appeared as distinctly different disks. It may well be this level of detail that is necessary to notice the effects of the cometary impacts.

As the event nears, the times of the fragment impacts will be known with more and more certainty. Even so, a 19 minute uncertainty is expected in the predictions as late as July 15. Currently, this number is greater than an hour. The point of the impacts will be about 6° beyond the western limb of the planet as viewed from Earth. This means that the impact point will quickly rotate into view, passing the planet's meridian less than three hours later. The fragments will auger into the cloud tops at around 44° South latitude in the same hemisphere as the Great Red Spot. Jupiter will be 99% illuminated, with the collisions occurring beyond the gibbous limb. It will take a keen eye to see any phase effect on Jupiter.

Ideally, some collisions will happen while the planet is in the nighttime Arizona sky. The optimal time of such a collision is between 8 and 11 P.M. MST. Satellite placement is also of interest, as the moons may brighten slightly at the time of impact. Recent predictions put this brightening at as little as 0.05% of the sunlit brightness of the moon. The best scenario would be a case in which a nearby moon such as Io would have a clear view of the event.

Whether the atmospheric changes or satellite brightenings happen or not, it is interesting to take a day-to-day look at how the planet and moons will appear during our short observing window. The following satellite and Great Red Spot visibility predictions come from a terrific piece of Macintosh shareware written by Fred Sammartino of California. His HyperCard program accurately predicts and plots locations of Jupiter's satellites and Great Red Spot. Thanks also go out to Steve Lucas, who uploaded the latest impact time predictions onto an electronic bulletin board. He is making an effort to coordinate observations of the event.

Saturday, July 16: The first event is expected to occur at 12:00 noon, when fragment #21 plunges into the Jovian atmosphere. Observers who can't wait for nightfall will have a great opportunity for a daytime observation of Jupiter. By 3:30 in the afternoon, Jupiter will be situated 20° above the southeastern horizon and less than 4° north-northwest of the 8-day-old gibbous moon. For Dobsonian owners, that's "up and to the left."

As Jupiter becomes visible after sunset, perhaps the best collision circumstance of the next six days happens. Fragment #20 is slated for an 8:00 P.M. arrival with the planet. Io is almost optimally placed for full illumination by the impacting fragment. All three other moons are in view of the impact site. This should provide an early test for brightenings of the satellites. The impact site will rotate to the planet's meridian by 10:30 or so, with the planet still up 20°. Fragment #19 collides with Jupiter at 11 P.M.

Sunday, July 17: By nightfall, fragments #18 through #16 will have been absorbed by Jupiter's atmosphere. The Great Red Spot will be just past the meridian at this hour. The longitude of fragment #16's impact site is similar to that of the Red Spot, so it will be interesting to see if any interaction with the great storm occurs. Io and Europa are to the west of the planet. In good conditions, Io's disk should appear yellowish. Europa, the smallest of the Galilean moons, will be the most difficult to resolve into a disk.

Monday, July 18: This is not a good day for comet impact events as viewed from Arizona. Fragments #15 and #14 will have impacted at midnight and noon, respectively. Nevertheless, it is a good evening to watch the shadow transit of Jupiter's largest moon, Ganymede. The shadow will be located near the planet's north pole, crossing the meridian at 7:20 and departing the planet at 8:20. Notice the distance between Ganymede and its shadow. Europa will be to the south of Ganymede.

Tuesday, July 19: Fragment #12 (#13 has disappeared) collides at 3:00 A.M., while #11 meets with Jupiter at 4:00 P.M. The Great Red Spot will be well placed for viewing during the entire observing window, as it reaches the meridian at 9:40 P.M. By this time, we should know pretty well whether or not these impacts are at all observable. If no effects are observed, some people will be holding out for the largest fragment impact, which will occur on the 20th.

Wednesday, July 20: Fragments #9 and #8 (#10 has also disappeared) collide with Jupiter in the morning hours. Fragment #7 will collide at noon, Arizona time. This piece is thought to be between 3 and 4 km across. That's a lot of energy to absorb! Observers in Europe should be able to witness the effects of the collision with the planet up in a night sky.

Watching Europa and its shadow transit the disk of Jupiter should add interest to the scene. Mid-transit of Europa occurs at 7:38 P.M. The moon departs the disk at 8:54. Five minutes later, the shadow appears on the ball of the planet. The shadow's mid-transit time is 10:13.

Thursday, July 21: As if to display a grand finale, no less than five impacts occur on the last day. Only the impact of fragment #2 is well placed for Arizonans, occurring at 8 P.M. Both the impact site and the Great Red Spot rotate into view at the same time. Watch Io disappear behind the planet at 9:07. The last fragment enters the Jovian clouds at 1 A.M. this evening.

After this hectic week is over, the Jovian atmosphere could be in complete turmoil. Maybe nothing will be detected. If past events such as the 1993 Perseid meteor shower and a number of comets can be used as a guide, it is likely that nothing will happen. Lifetime amateur astronomers will look upon this as an excuse to observe Jupiter's always changing appearance for six days and be perfectly content even if the comet does nothing at all to the planet.

The Ancient Maya and the Sky: Venus

by Réka Fromm

Venus, the older of the hero twins, was widely studied by the ancient Maya. It wasn't just a simple character in their mythology; they took this planet much more seriously than that. As a celestial body, they had different names for it, the most common ones being Noh-Ek (great star) and Xux-Ek (wasp star). One of their main concerns was to study its positions and motions. As they believed that these positions and motions were of major importance regarding life in their Middleworld, they adapted their ceremonial almanac, their calendar and their lives to these positions.

In the Maya codices there are extensive calendrical tables, one group of which features the synodic cycle of Venus, called the "Venus Table". Here they recorded the most important Venus positions in order to be able to time some of their ceremonial events after them. Beginning with their Classic period, warfare was one of these events. Being one of the most important moments in the ancient Mayan society, it seems just natural that they started to time their wars "scientifically," after a star, hoping for help from the deity they chose. What better deity could they choose for this reason, than the older hero twin, the "great star", Venus. Called Tlaloc-Venus wars, or simply star wars by scholars, these wars started on specific Venus positions and pitted city against city. These wars were totally different than the ones that the Maya ever had before. Beginning with Tikal versus Uaxactun, these star wars were played for stakes much higher than reputations or lives of individuals. The winner got the whole city he was fighting against, being able to transform it according to his needs. These were the first wars of conquest in Mayan history. The rulers, with the priests' and astronomers' help, timed them after particular points in the Venus cycle, especially the first appearance as Evening star, but they also kept in mind the positions of other "stars," like Jupiter and Saturn. They used these planets' stationary points as guide. The attacker, Tikal, won the very first (as far as we know) of this kind of war. After winning, its king, Stormy-Sky performed a public ritual in the honor of the "great star", when Venus was near its eastern elongation.

Other events, especially the ones in the rulers' lives, such as accessions were also timed by considering Venus positions. Examples of these kinds of events were found all over the Mayaland. Accession of a king was timed at the maximum elongation as evening star in Bonampak, another accession was timed for the first appearance of Venus as morning star in Piedras Negras.... They probably believed that by timing their accession on these dates, they would have the help of this mythological hero for the time of their kingship.

Even though they considered this celestial body a deity and treated it accordingly, the ancient Maya knew a lot about Venus—almost as much as we did before the telescope. Based on their calculations, they made up the Venus calendar, with a basic period of 584 days, the value they considered for a whole synodic revolution of the planet. They knew that this value was a little too high (Venus makes one synodic revolution in almost exactly 583.92 days) and they also knew how to correct it. One of their important ceremonial periods was the time unit composed of five synodic revolutions of Venus (2,920 days), as they also discovered that this period was equal to eight of their calendar years (365 days, based on the solar year), a coincidence that they used according to their needs. This way they could combine eight Earth years with five Venus years. It was a convenient period for correcting the Venus calendar, which was falling behind the apparent Venus year. As presented in the Dresden Codex, the Venus calendar is made up of three distinct calendars, each composed of 65 synodic revolutions of the planet. Each one of the three Venus calendars is equal to 104 Earth years, but there is an overlap between the first and second, also between the second and third. The corrections were inserted at these points, where the calendar Venus year overran the synodic Venus year. By the use of this table the Venus -- solar period was kept in harmony with the movements of the planet for 384 years, before the accumulated error would make the table useless.

They also needed calendars of shorter periods of time, so they divided these 584 days into smaller periods, also according to Venus' positions. As we all know, this planet, in its synodic revolution divides into four periods: after inferior conjunction it is the morning star for about 240 days; then disappears for about 90 days during superior conjunction; it reappears as evening star for another 240 days; then it disappears again for 14 days during inferior conjunction.

The Maya assigned slightly different values to these periods. According to their astronomy, Venus was the morning star for 236 days, invisible for 90 days, the evening star for 250 days and invisible again during superior conjunction for 8 days. It has been suggested that the lengths of these Venus phases were arbitrarily fixed to agree with lunations.

For the ancient Maya, Venus was one of the most important celestial bodies and also one of their most important deities. Sometimes they used metaphors in naming it, calling it "day bringer", when it appeared as morning star and "herald of darkness", when it appeared as evening star. They worshipped it but they also studied it. And they did find out a lot about it, without telescopes, modern measuring devices or computers. With only a lot of patience in observing and noting the known dates, they were able to determine its synodic revolutions, and to learn about its movements. Even though they explained its appearances by mythology, timing the major events in their lives after this planet, they were one of the first people in the world who recognized the morning and evening star as the same, and who could determine with a very close approximation the Venus year.

The Discovery of An Asterism

by Don Farley

On a warm evening in mid-July 1993, I was investigating the sky in the area of M104. I must say it is not the most interesting of areas, but one where doubles and triples seem to abound. I came upon something that I had never seen before. The fact that I had not seen anything like this before is not too astounding, since I have only been in amateur astronomy for a short time. [I had owned my current telescope for only six months at the time I made the discovery.]

The telescope that I have now lends itself nicely to searching the sky through the eyepiece. The telescope I speak of is a ten-inch Meade LX200 with an altazimuth mount. While using the slow slew rate, I can easily watch the sky move through the eyepiece. Without this feature, I am sure that I would not have found the asterism.

Well, after I found the asterism, I was not sure that it was anything at all. The asterism I discovered is a group of stars that forms a perfect, or very nearly perfect equilateral triangle. Inside this triangle is another perfect or very nearly perfect equilateral triangle. The inside triangle was about half the size of the outside triangle.

From that day on I have been finding it on and off, but never able to advise others how to find it. On the night of April 2, 1994, I found it again and my friend, John Durham and I set out to document the find. Through the use of the computer connected to his Mead DS10, we were able to determine the coordinates. The coordinates are R.A. 12h 35m, declination -12. On Sky Atlas 2000, it appears as only a black blob except under a magnifying glass. Under the magnifier you can see triangle shape, but nothing that I would go looking for.

I do not know if this find is new, but to me it is what astronomy is all about. There is so much out there that is not documented that even the most novice astronomer can feel he is experimenting with the unknown. You can't do this with any other field of science. With the aid of a telescope, you can be the next hero of the stars.

I like to think that something will come of this find. I have talked to many people that have never seen anything quite like this. These people have been the ones to prompt me to write this, even if this is not the find of the century. But for me, it is the find of a lifetime.

The opportunity to be the first or one of the few to see something, is what keeps me looking up. Certainly there is nothing in the world that is as beautiful as an evening under the stars. There are never enough clear nights to see everything, but you can be sure that I will see a lot of the wonders of the universe.

Just after writing this article, I received a letter from Phil Harrington informing me that my asterism will be included in his upcoming book entitled "Harrington's Handbook of the Heavens." For an amateur this is an honor. I am told that the asterism will be called Farley's Triangle.

EVAC Members as of May 16, 1994 (Sorted by name)

Name

Manfred Alber
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Don Bechtold
Dan Beck
Alex Beck
Jerry Belcher
David Brown
Earl Brown
Walter Carruthers
Steve Conner
Paul Cooper
Spencer Covington
John Daly
Bill Dellinges
Don Dorchester
John & Nellie Durham
Don Farley
Saul Fein
Dennis Fox
James Hamblin
Tom Harvey
Bill Heckathorn
Ted & Brenda Heckens
Sam Herchak
Frank Honer
Randy & Jan Iliff
Michael Janes
Mark Johnston
Kirk Keating
Bob Kelley
Robert & Beth Kerwin
Mel Kirschner
Leon & Fannie Knott
George Kohl
Frank Kraljic
Roger Kubeck
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Marc Leichter
Bob & LIn Leivian
Carl Lorson
Gene Lucas
Gordon MacKay
Chuck Manberg
Stewart & Matthew Mann
Matt Maynard
Chris McFarland

EVAC Members as of May 16, 1994 (Sorted by name)

Name

PO Box 809
Jerry Misner
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George & Peggy Palfy
Bill & Kajia Peters
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Bill Smith
Steve Smith
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Emerson Stiles
Scott Strawn
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Russell Wilson
Don Wrigley
Art Zarkos
Frank Zullo

The Deep Sky Notebook

by Robert Kerwin

Some Little-known Spring Globulars

For deep sky observers, spring is almost synonymous with galaxies. After all, the spring skies contain little else in the way of deep sky objects, right? As it turns out, however, the spring skies also have a few interesting globular clusters to offer. Although not in the same class as M13 or Omega Centauri, these clusters are interesting nonetheless and make for a little variety in your spring observing program.

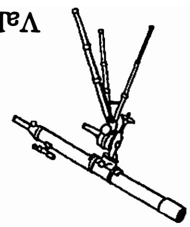
Our first object is **NGC 5446**, which can be found about nine degrees east of Epsilon (ε) Bootis. If you use ε as your starting point, you may want to examine the star under higher magnification—ε is a beautiful colored double star. NGC 5466 appears as a rather unconcentrated round glow about seven arc-minutes across. Its surface brightness is low, but in an eight-inch or larger telescope you may be able to see a sprinkling of a few very faint stars across the image.

Our next object is **NGC 5053**, in Coma Berenices. NGC 5053 is easily found just over a degree east of fourth-magnitude Alpha Comae. Similar in appearance to NGC 5466, this object appears faint and unconcentrated. With an eight-inch telescope, I was able to detect a few faint stars scattered across the cluster. About a degree to the northwest is **M53**, a much easier object. M53 appears about five arc-minutes across and is moderately concentrated toward the center. A six-inch scope should be sufficient to give tantalizing glimpses of resolution. In my eight-inch reflector, the outer fringes appear fairly well resolved and the central regions appear granular. There is a bright star on the northeast edge of the cluster.

M68, in Hydra, is one of the brighter spring globulars, but does not seem to be very popular, perhaps because it is overshadowed by nearby M104 and M83. Nevertheless, M68 is easy to find. Look for a fifth-magnitude star about four degrees south of Beta (β) Corvi, the southeastern star in the "diamond" of Corvus. M68 is a mere ½ northeast of this star. This globular appears about ten arc-minutes across in moderate-size telescopes and is weakly concentrated toward the center. In six-inch and larger scopes, you should be able to at least partially resolve the cluster. Exactly two hours of right ascension east of M68 is **NGC 5694**, also in Hydra. This cluster is moderately condensed and appears about two arc-minutes across. This globular will probably require at least a 12-inch telescope to achieve even partial resolution.

About eight degrees southeast of NGC 5694 is **NGC 5824**, in the constellation Lupus. This cluster is small, but quite bright and strongly concentrated toward the center. No hint of resolution can be seen in medium-size telescopes, and resolution is probably beyond the reach of all but the largest amateur scopes, especially taking into consideration the southerly declination of this object. Completing our tour of spring globulars is **NGC 5897**. Located in Libra, NGC 5897 can be found approximately midway between Gamma (γ) and Sigma (σ) Librae. This cluster appears rather diffuse and can be partly resolved in eight-inch and larger scopes, showing a granular texture across the image.

Name	Type	Mag	Dimensions	Const	SkyAtlas	U2000	R.A.	Dec
NGC 5466	glob cl	9.0	11'	Boo	7	110	14h 06m	+28° 32'
NGC 5053	glob cl	9.9	10.5'	Com	7	150	13h 16m	+17° 42'
M53	glob cl	7.5	12.6'	Com	7	150	13h 13m	+18° 10'
M68	glob cl	7.7	12'	Hya	21	329	12h 40m	-26° 45'
NGC 5694	glob cl	9.2	3.6'	Hya	21	334	14h 40m	-26° 32'
NGC 5824	glob cl	7.8	6.2'	Lup	21	373	15h 04m	-33° 04'
NGC 5897	glob cl	8.6	12.6'	Lib	21	334	15h 17m	-21° 01'



Valued EVAC member since 1/17/92!

EVAC/Robert Kerwin
1406 N. 85th Place #117
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Vekol Road Site