AD ASTRA

Vol. II, No. VI | *The Newsletter of the Atlanta Astronomy Club* | February 1988

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CLUB CALENDAR

Next Meeting: February 19, 8:00 p.m. at the Bradley building. *Early warning:* The March meeting will be held at the Fernbank Planetarium, *not* at the Bradley building. It will begin at 7:00 p.m. so as not to conflict with the regularly scheduled planetarium show.
Monthly Program: To be announced.

AD ASTRA is published monthly during the academic year by the Atlanta Astronomy Club, Inc. The AAC, a non-profit organization, is dedicated to the advancement of amateur astronomy, and fostering the social, literary, and educational needs of its members. Meetings are held on the third Friday of each month (second Friday of December) unless otherwise announced in this publication. Membership dues are $25 annually and include a subscription to *Sky & Telescope* magazine and use of club observatory facilities.

Editor in Chief: ..... John Marsh
Managing Editor: ..... Don Barry
Technical Editors: ..... Sharone Franklin, David Roberts
Rick Clark, Richard Jakiel

Submissions: Article submissions are most welcome, and may be delivered to the editor for consideration.

CLUB MINUTES

The January 15, 1988 meeting of the Atlanta Astronomy Club was held at the Bradley Building with president Lee Wilson presiding. Dr. Robert Roper of the Geophysical Sciences Department at Georgia Tech presented the program. Dr. Roper described the methods used in determining the intensity of atmospheric turbulence and how this turbulence can change the refractive index. He also explained how meteors are observed using radio waves to detect the ionized trail which is produced by the meteor.

A SPEEDY RECOVERY...

Life Club member Walter Barber, Sr. had a brief stay in Emory Hospital for an operation on two vertebrae in his lower back to free up pinched nerves from an automobile accident thirty years ago. He was on his feet in two days and went home a week later. We wish him a speedy recovery so that he can continue to join us at the observatory on clear evenings.

STARRY, STARRY NOTES

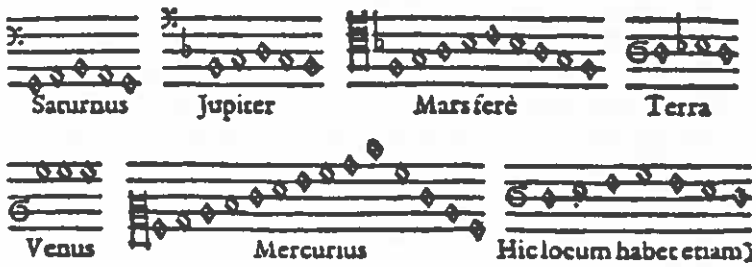
by Don Barry

> The rotation of the universe and the motion of the planets could neither begin nor continue without music. For everything, they say, is ordered by god according to the laws of Harmony.
>
> Plutarch (ca. 46--120 AD)

The starry heavens, captivating, revealing, inaccessible and mysterious, have inspired man from time immemorial to ponder the structure of the cosmos and his place within it. Survival itself for the earliest agrarian and nomadic tribes required following the rhythms of the sky calendar; depictions of these first artist-scientists remain as sky effigy rock drawings still found at some ancient sites. As civilization advanced, the task of unravelling and glorifying the philosophy and mechanism of the sky fell to the increasingly distinct and specialized fields of science and art; even as these disciplines diverged, astronomy and music retained a unique pairing, perhaps due to the intrinsic aesthetic of the expanse above. This grand syzygy has forever enhanced both fields.

During the artesian burst of Greek thought some three millenia ago was developed a music based on cycles of note intervals, called "modes". The freedom and mathematical generality of this music mirrored the work of the Pythagorean geometers, whose paradigms of form culminated with Ptolemy's theory of epicyclic planetary motion. And foremost in these two fields were the concepts of "motion" and "structure" unified in antiquity.

After many dark years, resurgence awaited the reincarnation of Greek geometry in the person of Johannes Kepler, whose astronomical postulations were often justified by dialectic invoking metaphor of music and rhythm. His *Harmonice Mundi* (Harmony of the World) bore the famed 3rd law of planetary motion, and a novel supposition that the planets' elliptical orbs could represent musical motifs based on motion and distance. This "innate"



Kepler's themes for the planets

property of the solar system, he hypothesized, was the germ of consonance and dissonance in music, and mimicked harmonic practice in mans' music:

> "The motions of the heavens, therefore, are nothing else but a perennial concert tending ... towards definite and prescribed cadences, each chord being of six terms (as of six voices) and by these marks distinguishing and articulating the immensity of time; so that it is no longer a marvel that at last this way of singing the several parts, ... should have been invented by Man, the ape of his creator; that namely, he should, by the artificial symphony of several voices, play out, in a brief portion of an hour, the perpetuity of the whole duration of the world, and should to some degree taste of god the creator's satisfaction in his own works, with a most intensely sweet pleasure gained from this Music that imitates god."

Although Kepler's metaphysical style of inquiry was soon abandoned in the growing scientific revolution, music remained an important aesthetic stimulus to the new schools of natural science. Christiaan Huygens (1629-1695), mathematician, astronomer, optical designer, and physicist, was born into a musical household harboring a vast collection of musical paraphernalia for performance of his father's 769 airs for various instruments. Huygens developed the first telescopes of sufficient power to reveal the true ring structure of Saturn, and also devised a system, the so called *Cyclus Harmonicus*, of musical tuning that was similar to the "Just Temperament" then in practice. A skilled flautist and harpsichordist, scientific meetings at his home would often include entertainment on the instruments at hand.

In England, Robert Smith, FRS, Plumean professor of astronomy and master of Trinity College, Cambridge, wrote one of the first treatises on Harmony. His dual scholarly interest presaged that of another gentleman, born in Hanover and raised a musician, who would be fated to emigrate to England and win fame not from his profession, but his avocation.

Sir William Herschel (1738-1822) was the son of an oboeist, and made his living initially as a skilled musician. Though his brother Jakob remained in Germany and became master of the King's band, eventually to be strangled at an untimely age, William travelled to England where his musical credentials were quickly established. After the composition of a symphony and two wind concerti, he began the construction of several large telescopes, by which he discovered a great number of galaxies and nebulae, and then in 1781, the planet Uranus. In 1792, the best minds of music and astronomy met when Herschel, at the height of his fame, received Haydn, the elder statesman of the symphony. Perhaps Haydn was inspired by the events of the decade when he later wrote *Die Schoepfung* (The Creation), and depicted in its music the formless chaos of the beginning that would eventually become an element of modern cosmological theory.

After Herschel's era, astronomy was sufficiently established that one needn't know an instrument to make a living at it, and fewer musicians seemed to keep astronomical themes at heart. Although Mozart's *Eine Kleine Nachtmusik* (A Little Night Music) only vaguely seems depictive of the skies despite its programmatic title, Beethoven's *Piano Sonata #14* quickly earned the appellation "Moonlight" when a critic described its first movement as evoking moonlight shining over Lake Lucerne.

By late in the 19th century, though, the schism of the fields seemed complete. Camille Saint-Saens, famed french composer, and also member of the French Astronomical Society, composed no music glorifying the sky, although he did give several papers before the Societe on dilettante astronomical subjects. The height of the maudlin was reached with Gustav Holst' famed *Planets* suite, which purported to describe the solar system not with astronomy, but rather with the voodoo of astrology.

Perhaps with its greater mysteries explored, astronomy had ceased to motivate musical inspiration. Works touching on astronomical subjects in the 20th century have explored aesthetic psychology, such as in Henri Dutilleux' *Timbres, Espace, Mouvement*, inspired by van Gogh's *Starry, Starry Night*. Others have perhaps unwittingly commented on the divergence, such as Langaard's *Symphony #14*, whose second movement is entitled "Morning Stars Unnoticed". In Mahler's glorious *Symphony #7*, not one, but two "Nachtmusik" (Night Music) movements are present, but instead of evoking overt astronomical metaphors, the sections explore the psychology of the moods of the night, comparing the withdrawn and nostalgic with the lyric and sensuous. His earlier *Symphony #3* had opened with a monumental depiction of primordial energy, and a later quiet choral movement entitled "What the Night tells me." These might be considered the Romantic movement's last echo of starry inspiration.

Possibly the coterie of the philosopher-scientist is, with increasing specialization, nearing its end. Many professional astronomers now seem sequestered from the cult of wonder that was prevalent in the past. Even in the technocratic age, though, sometimes a glimpse of the past is afforded. At an eclipse some years ago, an eminent planetarian stood in the moors of Scotland in the throng awaiting totality. He recorded how, as the Bailey's Beads heralded the emergence of the pearly corona, astronomical teams frenzied to diagnose, quantify, and dissect the phenomenon. Suddenly, a lone Scotsman began to play his bagpipes. For a brief moment, the crowd was still, and in this age of the quantum microcosmos the wonder of the past was recaptured.

Recently, Philip Glass wrote a work entitled "Light" to honor the centennial anniversary of the Michelson-Morley experiment which showed the essential symmetry of space and the relativity of all motion within it. In occasional festivals, music still remembers its roots. And although mutual practice of the fields is now rare, individuals skilled in one continue to enjoy the other. Music is omnipresent in observatories throughout the world. Planetarium programs still feature, on occasion, the planets waltzing in annual motion to some energetic allegro. And the amateur still brings music with his telescope to enrich and season the night sky.

Richard Wagner captured this special timbre of awe when he penned the Song to the Evening Star in his opera *Tannhauser*:

> "There you shine, O fairest of the stars, and shed your gentle light from afar; your friendly beam penetrates the twilight gloom and points the way out from the valley."

To anyone who has sought knowledge and inspiration from the skies, this vision is unassailable.

THE WORLDS WE SEE

by Pat Frank III

Tonight many thousands of human beings across half of the globe will tilt their heads back to peer into the nighttime sky. They will gaze at wondrous objects, some of which have remained unchanged for millennia, and indeed many of them will be looking for the very first time.

We live in a golden age of astronomical interest. More people today are wondering what's going on "out there" than ever before, and thanks to modern mass communications, they know more about it.

But what of astronomy's history? How did we get to where we are today? Whose brilliant idea was it to use the lens of a pair of spectacles to magnify the lights in the sky? How have cheap, portable reflectors changed the way astronomical research is done? And what in the world is a speckle interferometer and can I feed it to my dog?

This series of articles is designed to discuss just that. Each month I'll take a big development in astronomy or astrophysics and trace its history of discovery or development, with major emphasis not on how it works, but rather what makes it so important today. This month I'll begin with that most basic and yet most complex, most common and yet most important of all astronomical tools: the telescope.

In 1608 a Dutch spectacle-maker by the name of Hans Lippershey came up with a brilliant idea. He took one of his standard convex lenses and placed it next to a concave one. Then, holding the combination at arms length, he discovered that he got an image (albeit upside down) that was three times closer than normal! Calling his device a "looker," he sold it to the military for 900 florins.

About a year later Galileo Galilei, a professor of mathematics and astronomy at the University of Padua, Italy, and already known as a serious investigator and brilliant lecturer, read about Lippershey's development. Without even having seen a "looker," he immediately constructed one of his own, eventually increasing the magnification to about 32x, and uprighting the image. Then he took his device outside and became the first person that we know of to point a telescope at the sky.

When Galileo published his early observations in 1610 in a book titled *Siderius Nuncius*, or the Starry Messenger, it took the entire western world by storm. Why? Because it contained real, empirical evidence that the universe was not at all what it seemed.

The popular conception of the universe at this time was called "geocentric" because it was centered around the earth (if you were to switch the first two letters of that word, you would discover how the *church* viewed the universe). Many people believed, in fact, that if the earth were truly moving that the moon, being a smaller body, would never be able to keep up. But in a paper published in the year of his death (1543) a well-known astronomer named Nicolaus Copernicus suggested that the sun was the center, and that the planets revolved around it. He based this belief on certain unusual properties of the planets' orbits. But unless you were a mathematician yourself, these oddities really meant nothing. And besides, the Pope said that they were false.

But what Galileo saw over sixty years later began to change all that. One of the first things he noticed was that the planet Jupiter had planets of its own. People had said that the moon couldn't keep up with a moving earth, and yet here four examples of precisely that type of motion. He also noticed that the planet Venus went through phases, just like the moon. In the geocentric view of things, the sun was closer than Venus, and therefore always shone fully upon it.

But what probably really ticked off the church (just one opinion, mind you) was what he said about the moon. Galileo saw craters, mountains, valleys, and even vast dark areas he called seas. Church doctrine said that all heavenly bodies were perfect spheres. In fact one critic, Ludovico delle Colombe, argued that these lunar features were actually "submerged beneath an invisible sea of crystalline material whose outer surface was perfectly smooth".

These discoveries, of course, led to a tremendous cultural upheaval all over Europe, with Galileo ending up under house arrest for the rest of his life (although in all fairness many believe he was warned by certain pro-reform Catholics that he had only to wait patiently to be accepted by a politically pressured church).

And why did three hundred years separate the first use of glass as lenses in spectacles and the first telescopes? In his book *Connections*, James Burke suggests that one has but to look at the period of which we speak: The Dark Ages. Meaning, basically, that from 1300 to 1600, nobody in Europe was particularly interested in examining the sky.

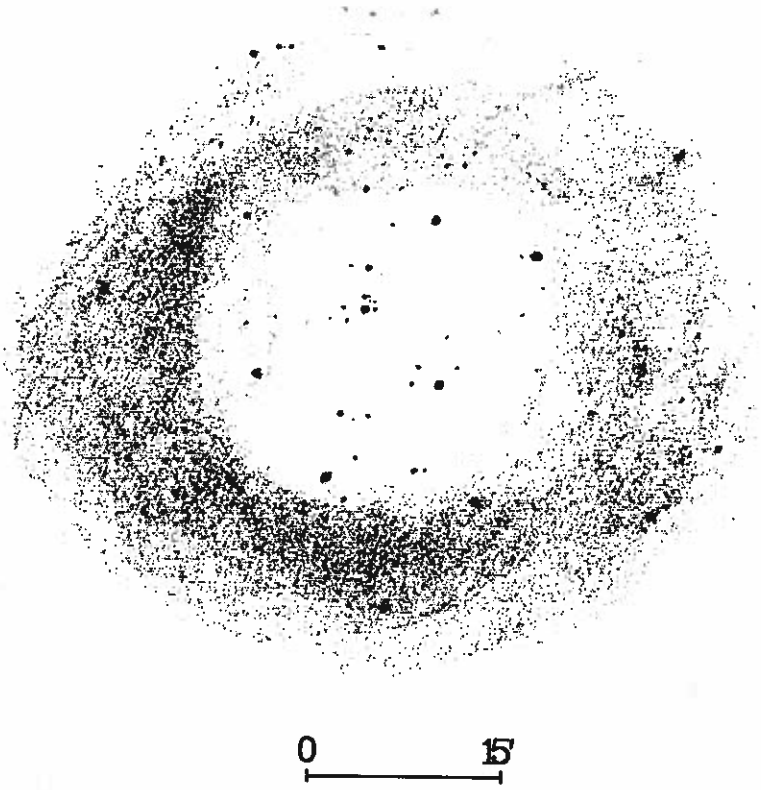
And so I leave you with this thought, from Leibniz' *Discourse on Metaphysics*, "Uti minus malum habet rationem boni, ita minus bonum habet rationem mali," which means that just as the worse may have good reasons, so the less good may have bad reasons.

Sources:

1) *Connections*, James Burke, 1978
2) *Exploration of the Universe*, George O. Abell, CBS, 1982
3) *Discourse on Metaphysics*, Gottfried Wilhelm Leibniz, from *Philosophy: A Literary and Conceptual Approach*, Burton F. Porter, Harcourt, 1980

CLASSIFIED

For sale: Miscellaneous eyepieces. 20 mm Meade research grade Erfle, $35. Celestron 12.5 & 40 mm Orthoscopic, $15 each. 7.4 mm Televue Plossl, $50. 26 mm Celestron Plossl, $20. 1.25" prism star diagonal, $10. Premium grade Lumicon nebula filter, $40. Nikon T-ring, $5. Battle-scarred but serviceable case, $15. Contact Pat Frank, 634-0910.



SMALL, ROUND, AND DIM

by Richard Jakiel

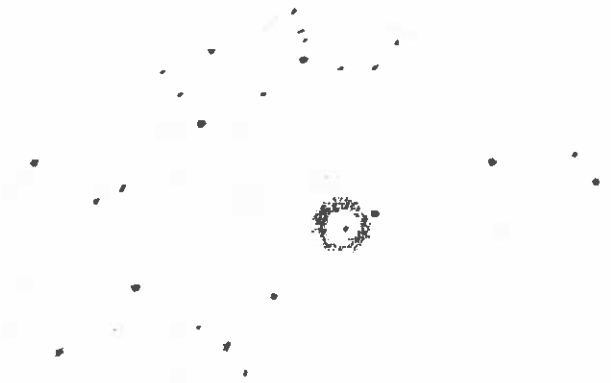
The winter sky is noted for its beautiful star fields which are a delight for naked eye, binocular, and telescope observers alike. Many of the brilliant blue-white stars found in and around Orion are part of the Orion OB association, a loose grouping of highly luminous O and B stars. These stars are very young, being not more than 10^7 years old (the sun is $5x10^9$). Nearby are giant molecular clouds, such as the Orion complex which includes such notable objects as the Great Orion Nebula (M42/34), the Horsehead Nebula, the Pi Nebula (NGC 2023), M78 group of nebulae, and the huge, dim Barnard's Loop. Also part of the same complex is NGC 1788, a bright nebulous patch measuring 6' by 4'. In a 10" telescope, NGC 1788 appeared as an elongated fuzz spot with relatively little apparent detail, and having a magnitude of 10.5.

NGC 1788 at 120x

To the northeast of the Orion complex is a spectacular nebulous star cluster NGC 2244, better known as the Rosette nebula. The main mass of the cluster occupies a relatively cleared out part of the nebula. The origin of this "hole" is the result of the intense stellar winds emitted by the 5 O-type and 16 B-type stars which occupy this region. The nebula is an immense, somewhat irregular annulus spanning about 2.5 telescope fields at low power (95x) when using the 20" f/4.5 scope. Only subtle density shifts can be detected in the nebulosity, but long exposures display a wealth of detail including irregular dark lanes and small dark spots better known as Bok globules, possible places of nascent stellar activity. The Rosette nebula complex is also surrounded by a number of large, coarse star clusters such as NGCs 2252, 2239, Cr 97, 104, and 107.

Nearly 20 degrees south are the bright star clusters M46 and M47 in Puppis. M47 (NGC 2422) is the larger and brighter of the two clusters; it consists of several dozen bright stars coarsely strewn about. This cluster is best viewed in a moderately sized, rich field telescope of 6 to 10 inches diameter. Lying about 1 degree to the east, M46 is a much more impressive cluster and is best suited for viewing in a moderate sized (8-12") instrument. This cluster consists of several hundred stars of magnitudes 10 to 14, with a diameter of about 30 arc minutes. On the northeast side is NGC 2438, a large 11th magnitude planetary. In an 8 or 10" telescope, the annularity of this planetary is readily apparent and bears a resemblance to that of the much brighter Ring Nebula (M57) in Lyra. In the 20" scope, the NGC 2438 ring shape is even more pronounced, and due to its darker central area the 16.6 magnitude star is actually easier to observe than the central star in the Ring nebula.

Left: NGC 2244 (Rosette), at 95x, diameter 2.5 telescope fields. *Below left:* NGC1788, 10" f/6. *Below:* NGC 3132 at 175x. *Right:* NGC 2438 at 175x. *Below Right:* NGC 1851 at 175x. All drawings by Richard Jakiel, with the 20" f/4.5 unless otherwise noted.

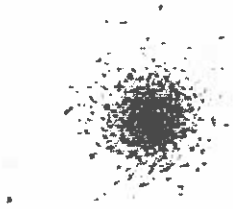


Much further to the southeast is the spectacular planetary nebula NGC 3132 (Eight-Burst) in the constellation of Vela. At a declination of -40 degrees, along with being in a relatively barren stretch of sky, this planetary is virtually unknown to observers in the United States. It is more than a magnitude brighter than that nebulous annular object in Lyra (magnitude 8.2) and is quite large -- about 80" x 60". The central star is extremely bright, estimated magnitude is about 9.5, as compared to 15.4 for that of the Ring. It is too bad that such an object is located in such a sullen spot of the southern sky, as it is one of the most impressive planetary nebulae I've ever seen.

Another deep-south object is NGC 1851 in Columba, which is a 6th magnitude, moderately sized (10') object in the 20" f/4.5 telescope. It contains a brilliant core, is almost as bright as M92, and is resolvable in the outer edges. Many other neglected and magnificent objects lurk at these lower declinations, but with patience, and clear skies to the south, they may be found with even small telescopes. The 20" is limited to objects above about -40 declination due to the roll-off roof, but smaller telescopes can be trundled to convenient sites at the Walter Barber Observatory to view objects nearly down to -50 declination, such as Omega Centauri and the Bug planetary in Scorpius' tail.

Eugene Powell writes, "On Friday night, January 29, I sighted a brilliant fireball while driving south on Roswell Road in Sandy Springs just north of I-285. It appeared about 15 degrees above the south horizon at about 8:58 p.m. and moved majestically towards the southwest, at about a thirty degree angle to the horizon. It was difficult to estimate its brightness, due to many city lights, but it was definitely much brighter than Venus, but less than the first quarter moon, probably about -6 or -7 magnitude. It was a beautiful greenish color and trailed sparks. Its path was at least 30 degrees long and straight, thus it was definitely not a man-made flare or fireworks display."

Such events are worth recording, especially if done as carefully as Eugene's description above. From records like this, meteorites are sometimes found, or calculations of the meteor's orbit are performed. If you notice something unusual in the sky, report it. It can be important.



COMET LILLER (1988A)

William Liller of Vina del Mar, Chile, discovered a this comet January 11, 1988. Currently in Pisces, Liller should ascend through Triangulum and Andromeda over the coming months, though it will be lost in the sun's glare in late February and much of March. Expected to remain between 6th and 7th magnitude for much of this time, it should be an interesting binocular and small-telescope object.

Coordinates (1950 Epoch)
T = 1988 Mar. 31.187 ET w = 56.931
W = 30.667
q = 0.84842 AU i=73.427

Date	RA (1950)	Dec
Feb 14	0h05.49m	-4d40.4m
Feb 19	0h08.92m	-1d00.1m
Feb 24	0h12.57m	+2d44.6m
Feb 29	0h16.41m	+6d34.6m
Mar 5	0h20.45m	+10d30.5m
Mar 10	0h24.7m	+14d33.3m

OBSERVER'S ALMANAC

by Don Barry

Moon Rise, Set, and Phase

(All times are EST)

Date	Rise	Set	Phase	Date	Rise	Set	Phase
02/15	06:04	16:06	8%	03/08	23:42	09:15	81%
02/16	06:50	17:24	3%	03/09	----	09:51	73%
02/17	07:28	18:39	0%	03/10	00:48	10:34	63%
02/18	08:02	19:52	0%	03/11	01:53	11:28	52%
02/19	08:32	21:03	3%	03/12	02:56	12:31	41%
02/20	09:02	22:12	9%	03/13	03:52	13:42	30%
02/21	09:32	23:20	17%	03/14	04:41	14:57	20%
02/22	10:05	----	26%	03/15	05:21	16:12	11%
02/23	10:41	00:28	36%	03/16	05:57	17:26	5%
02/24	11:22	01:33	46%	03/17	06:28	18:38	1%
02/25	12:09	02:36	57%	03/18	06:58	19:48	0%
02/26	13:02	03:33	66%	03/19	07:29	20:58	1%
02/27	13:58	04:23	75%	03/20	08:01	22:08	6%
02/28	14:57	05:06	83%	03/21	08:36	23:17	13%
02/29	15:56	05:43	89%	03/22	09:16	----	21%
03/01	16:54	06:14	94%	03/23	10:02	00:23	30%
03/02	17:52	06:42	98%	03/24	10:54	01:24	40%
03/03	18:48	07:07	99%	03/25	11:50	02:18	50%
03/04	19:44	07:32	99%	03/26	12:49	03:04	59%
03/05	20:40	07:54	97%	03/27	13:48	03:43	68%
03/06	21:38	08:18	94%	03/28	14:47	04:16	77%
03/07	22:39	08:44	88%	03/29	15:44	04:45	84%

(----) indicates phenomenon does not occur on given day.

SATELLITES TONIGHT

Recently it was reported that the LDEF (Long Duration Exposure Facility) satellite launched from the Space Shuttle in 1984 was in danger of decaying. This satellite, roughly the size of a small bus, contains various experiments designed to measure effects of time-duration exposure in a weightless, radiation-filled environment. This satellite was due to be picked up by the shuttle some time ago, but the 1986 Challenger accident postponed recovery plans. My predictions indicate that the satellite is currently safe from decay for at least 4 years, and with reasonable solar activity predictions, may survive until 1998 or so. If it is not recovered by the Shuttle and is allowed to reenter, another "Skylab" may occur, with sizeable chunks reaching the earth's surface.

```
Friday evening, 26 February 1988
 Time(EST)   Az    El  H Range RA/Date D/Date  Mag
07:21:10PM 271.9 20.4 L 00837 00:12.9 +12d41 +0.4
07:22:26PM 226.2 28.6 L 00650 02:26.6 -13d49 +0.0
07:23:42PM 182.8 19.2 L 00865 04:57.7 -36d57 +1.1
 MIR                  USSR          D/S=0.53

Saturday evening, 05 March 1988
 Time(EST)   Az    El  H Range RA/Date D/Date  Mag
07:46:24PM 198.7 15.6 L 01315 04:33.4 -37d28 +3.0
07:47:43PM 181.9 28.9 L 00888 05:59.0 -27d17 +2.3
07:49:01PM 134.4 42.3 L 00678 08:15.4 -03d15 +2.3
Shadow entry.
 SALYUT 7             USSR          D/S=0.51

Sunday evening, 06 March 1988
 Time(EST)   Az    El  H Range RA/Date D/Date  Mag
07:16:21PM 173.4 25.0 L 00981 06:06.6 -30d51 +2.8
07:17:39PM 133.3 34.0 L 00792 08:10.8 -09d18 +3.0
07:20:16PM 071.3 15.3 L 01339 11:30.9 +23d51 +5.5
Shadow entry.
 SALYUT 7             USSR          D/S=0.47

Monday evening, 07 March 1988
 Time(EST)   Az    El  H Range RA/Date D/Date  Mag
08:22:59PM 290.0 22.7 R 01055 01:27.6 +28d30 +2.2
08:24:18PM 326.1 28.0 R 00917 00:42.7 +60d25 +2.1
08:25:36PM 000.9 22.0 R 01081 18:35.8 +78d12 +2.9
Shadow entry.
 SALYUT 7             USSR          D/S=0.40

Tuesday evening, 08 March 1988
 Time(EST)   Az    El  H Range RA/Date D/Date  Mag
07:50:15PM 263.8 15.0 R 01351 01:24.4 +03d15 +2.7
07:51:34PM 284.0 25.6 R 00973 01:22.8 +24d53 +2.0
07:52:52PM 324.7 32.8 R 00818 00:55.5 +60d36 +1.8
07:54:10PM 003.9 24.8 R 00997 16:57.5 +80d24 +2.8
 SALYUT 7             USSR          D/S=0.45

Wednesday evening, 09 March 1988
 Time(EST)   Az    El  H Range RA/Date D/Date  Mag
07:18:49PM 257.4 16.1 R 01300 01:14.4 -01d11 +2.6
07:20:08PM 276.6 28.7 R 00896 01:20.6 +20d32 +1.8
07:21:26PM 323.3 39.0 R 00722 01:18.9 +60d13 +1.6
07:24:03PM 026.3 15.6 R 01330 14:02.3 +60d09 +3.9
 SALYUT 7             USSR          D/S=0.49
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AD ASTRA

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Roswell, GA 30075

8901

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