

President's Message

I am afraid.

Why? Because Duncan Teague (Memphis, TN), our sneaky Southern Skies editor, asked Pashur House, the artist here in Nashville, to do a caricature of me. For a year and a half I have conveniently avoided providing a picture of myself to go with my comments. Personally it seems like a waste of valuable space, not to mention that I don't really have a good photo of myself. However after seeing Pashur's drawings of Waylena McCully and Sharon Mendonsa, the educators here, I am VERY worried; especially since I have not seen what it looks like.

Of course, the big news is that we are all still recovering from having more than one hundred delegates here for the annual conference. I know it sounds cliché, but if you were unable to come to Nashville, I think you missed a good meeting. However, even if you couldn't be here, maybe some people will offer their papers for publication in Southern Skies, or you can start planning for SEPA 97. Call Clint Hatchett (Pensacola, FL) for all the details.

The best conferences are those where everyone participates or contributes in some manner. SEPA 96 was a shining example of such involvement. More than thirty five papers were presented along with five very different planetarium shows. Of special note was the in depth show Hubble: From Here to Eternity produced by Duncan Teague's Craigmont Planetarium interns in 1995. Martin Ratcliffe (Pittsburgh, PA) watch out. There was also a laser program, a special field trip, and the first ever SEPA constellation shoot out.

Jon Bell (Fort Pierce, FL) was responsible for organizing the shoot out. But if you plan on competing in this event next year, you'd better practice, study obscure asterisms, and learn where to find Capricornus. Geoff Chester (Washington, DC) won a laser pointer from ILDA for his efforts. Secretary Treasurer Duncan Teague came in second. It was probably as much fun to watch as it was to participate. I might even be brave enough to try next year, especially since there won't be any pressure from being President or hosting the conference.

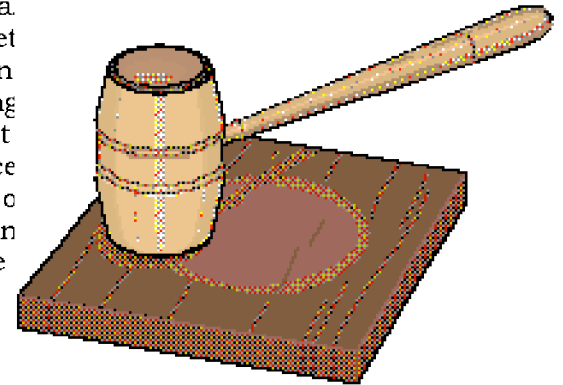
Unfortunately Sue Griswold (Charlotte, NC) could not join us, so she sent Doug Baldwin in her place, but he was not the Planetarium Director; not until she called Nashville and offered him the job, which he accepted. I am a delegate who may get because she happens to meet someone during meeting. But the best come of the conference the marriage proposal that was made during the riverboat cruise on Wednesday night. I heard through the grapevine that it was accepted.

There also was a very productive business meeting. In addition to the usual old business, we conducted quite a bit of new business. First, there were bids from Patrick McQuillan and the Alexander Brest Planetarium (Jacksonville, FL) and Britt Rossie and the Hopkins Planetarium (Roanoke, VA) to host SEPA 98. The members in attendance voted for Roanoke; to which Patrick responded, "You just saved me a whole lot of work."

Then there were elections for new officers. John Hare (Bradenton, FL) and Duncan Teague were both re-elected to the positions of IPS Representative and Secretary/Treasurer respectively. George Fleenor (Bradenton, FL) was elected President Elect and will begin his service in this position in January, 1997, when Mike Chesman (Kingsport, TN) assumes the Presidency from me, and I become Past President.

Lastly, there was discussion and a vote regarding a proposed change to the bylaws that would restructure and clarify the various categories of membership that were not addressed in 1995. Mike Chesman and his committee of Dave Hostetter (Lafayette, LA), Jim Hooks (Lumberton, SC), Gary Lazich (Jackson, MS), and Britt Rossie worked long and hard to craft this change, and they should be applauded for their efforts. Of course, nothing is perfect, and you cannot always make everyone happy.

Kristine K. McCall
President
Sudekum Planetarium
Nashville, TN



The next stage in the process is to define basic member benefits and outline the various prerequisites of each category. Council is working on that and hopes to publish recommendations in the Journal later this year.

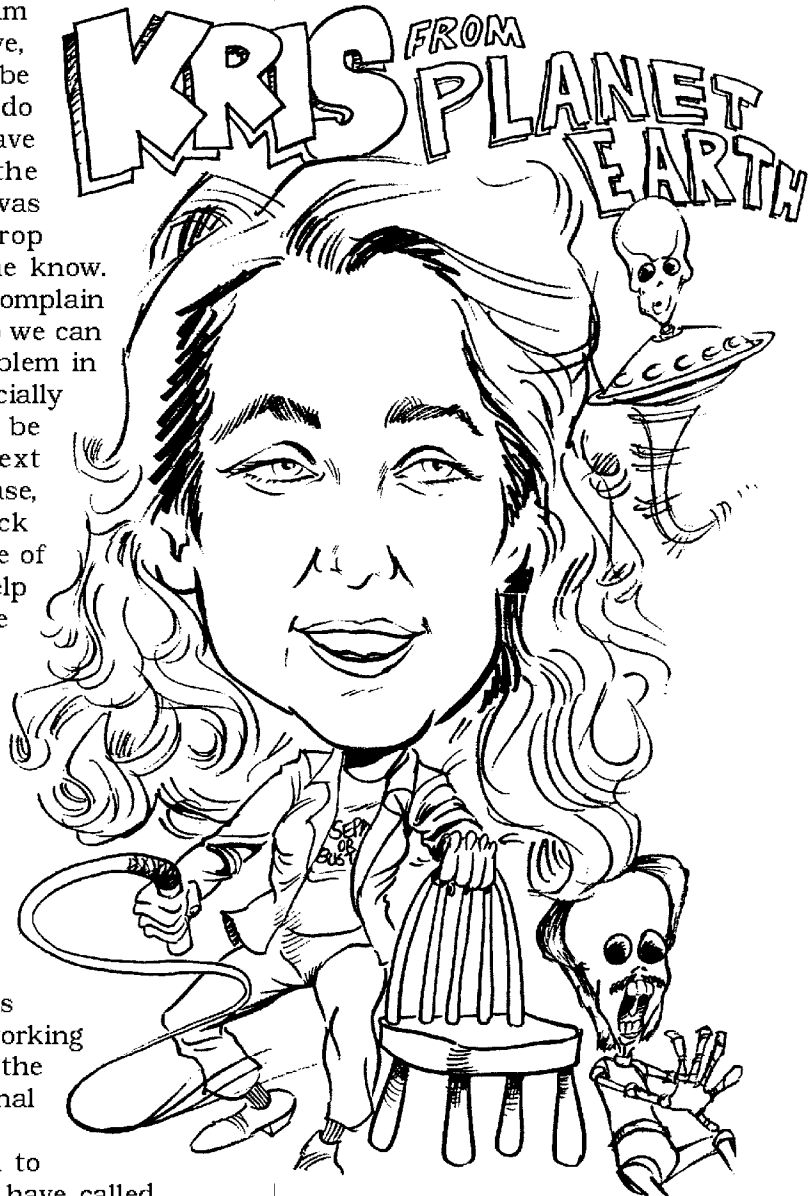
All in all, it was a good conference with a good balance of papers, programs, and fun. I am trying to be objective, and there will always be things that I would do differently. If you have some ideas about the way the conference was organized, please drop me a line and let me know. It does no good to complain if you don't tell us so we can try to avoid that problem in the future. I am especially pleased that we will be able to give the next host a master database, forms, letters, check lists, and a multitude of other materials to help make their task a little easier. Maybe they can learn from our mistakes.

I had hoped and announced during the business meeting that we would be turning over some proceeds from the conference back to the SEPA Treasury. However, as I write this I am still working to straighten out all the finances and get a final result.

Meanwhile, I wish to thank all those who have called, faxed, e mailed, and sent cards for their kind words about our little gathering. However, I cannot stress enough that it was truly a team effort. I could not have done it without my wonderful staff.

I also wish to thank those who jumped in to help throughout the week including those who helped haul stuff to the hotel, set up AV equipment, take down AV equipment, chair paper sessions, and anything else I could think of to delegate; although some people may run away the next time they hear me say, I need a volunteer.

There were a lot of new faces at this year's conference. Jane Hastings (Richmond, VA) challenges all of us to welcome and assist all new or young planetarians to the best of our ability. Only through such sharing of wisdom and experience and camaraderie can we hope to strengthen



the profession. In addition you might make some really neat friends in the process.

Enough of this rambling discourse for now. The deadline for Southern Skies is upon me. I wish I had had more time during the meeting to talk with all of you, but I still had a good time. SEPA is more than just a region or a Journal. It is composed of people who give it life and tradition and humor. For me it is family, and I look forward to seeing all of you next summer, if not sooner.

Drawing by Tracy Latham

When everyone was asleep during the SEPA conference, Kris McCall went above and beyond her duties as the SEPA President and fought off vicious aliens with her tools of the trade.... No...wait...!

Those weren't aliens... They were Jeff Potter and Curt Spivey

Let's Go Surfin' Now!

I'm so pleased to inform you that there is yet another site on the World Wide Web with astronomy information. Browse the site at <http://www.advanced.org/ThinkQuest/3461>, and hopefully, make kind comments about it. Three high school students could earn substantial scholarships if their entry in the ThinkQuest Internet contest is the grand prize winner. They could each be awarded \$25,000.

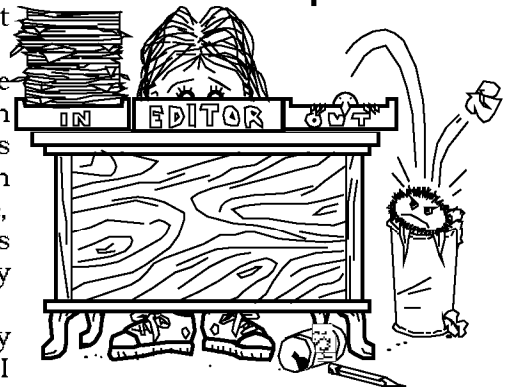
This site was created by sophomore Andrew Holbrook. Andrew is mentored by Madison (WI) Planetarium Director Geoff Holt. It's based on the script of Hubble: From Here to Eternity, the show produced by Craigmont Planetarium interns and presented at the Nashville conference. Riki Haley, a freshman at Middle Tennessee State University this fall, and three other interns wrote the script. Stephanie Lim, a soon to be freshman at Union University, downloaded and imaged graphics and wrote other materials for the contest entry. My colleague Lisa DuFur and I coached Riki and Stephanie.

In the aftermath of the outstanding conference in Nashville, SEPA now has 120 paid up members, and we have another 9 regional affiliates editors on our mailing list. They receive complimentary copies of Southern Skies.

I have a complaint for some of you editors. I thought the reason you were on our mailing list was for a publication exchange. To date, no other editor has ever sent me a copy of his/her publication. The only communications I receive on a regular basis from other planetarium or science organizations are from NSTA and Italy.

SEPA members would benefit from the information in your publications, so please be kind enough to share it with us. As Elvis would say, Thangyewverrimuch!

Duncan R. Teague
Secretary/Treasurer
Southern Skies Editor
Craigmont Planetarium
Memphis, TN



Mike Cutrera

IPS Report

I'm back from IPS 96 and recovered from 11 hours of time zone change. When the top 10 conferences are recounted, this one will be near the top of the list. Talking shop with fellow planetarians from far flung places was a highlight, but there was so much more. Our Japanese hosts spared no effort attending to delegates needs.

Over 300 delegates from 30 countries were there. Japan represented the majority. There were 47 delegates from the USA.

Four full fledged SEPA members were in attendance. Joanne McCullough, Phil Groce, Eric Melenbrink, and I did our best to uphold the SEPA tradition of little sleep and lots of drink. The latter was difficult. Some mixed drinks went for \$28.00; the average beer cost \$6.81! Receptions on three days featured copious amounts of food, ranging from sliced roast beef to su-

shi, and beer and whisky in abundance.

Jim Manning opened with a three minute address in Japanese! This took everyone by surprise, including the interpreter. We were treated to tours and shows, lectures, a variety of paper sessions (three concurrent sessions), vendor displays, an Asia Forum detailing the state of astronomy education in Asia, and spectacular cultural and social events.

Council met July 10 and 16. Much time was occupied with committee and regional reports and miscellaneous business. Montreal narrowly edged out Morelia, Mexico on the third ballot for the 2000 conference. The membership year changed to expire on the nearest quarter instead of December 31. The following are candidates for the fall elections: President Elect Jon Bell, Shoichi Itoh, Marie Radbo, Dale Smith; Secretary Noreen Grice, Lee Ann Hennig;

John Hare
ASH Enterprises
Bradenton, FL

Alexander Brest Planetarium Jacksonville, Florida

Dave Hostetter
Featured Planetarium Ed.
Lafayette Natural History
Museum & Planetarium
Lafayette, LA

The Museum of Science and History's Alexander Brest Planetarium is named after Mr. Alexander Brest. Mr. Brest is a local philanthropist who donated the money to build the current planetarium. He celebrated his 101st birthday last

a meeting/ classroom.

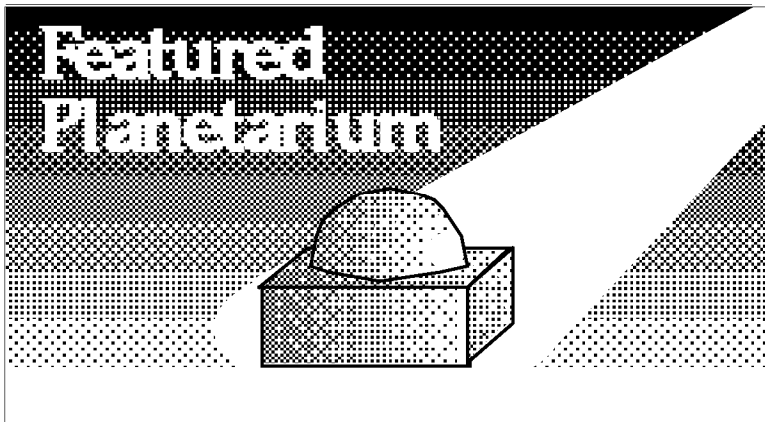
Many familiar names in the planetarium field have worked at the Museum of Science and History in one of these two planetariums. I'm sure you know these folks: Phil Groce, Kris McCall, Dr. Mike Reynolds, and Patrick McQuillan. Every now and then I find an old photo buried in a file cabinet with a face I recognize. (Some of these photos are quite humorous. Remind me to bring some to the next conference.)

As for current and future plans, the planetarium's automation and ancillary systems are being updated. Joe Hopkins (JHE) is working with us this year to install a new automation system for both our slide projectors and our star projector. JHE's Screenmaster and Microstar have been busy running programs for us since last September.

Video projection capability via Sony 1040 was added last September. We can project laserdisk, VCR, cable TV, or computer images on the dome. The video projector is in the cove and shoots across the dome, giving us a 60 foot diagonal image. The resolution isn't good enough to read small text, but it works well to provide big planet images during shows. We can put NASA select on the dome for use in programs. This makes it easy to update the public on what shuttle astronauts are doing (though it seems every time we check on them they are asleep). The laserdisk and VCR are automated through Screenmaster as is projector brightness and contrast.

The biggest update is coming this September. We're replacing the antiquated (8 inch floppy) Jena star projector automation system with JHE's Brightstar Console. This should make operation and maintenance easier. The current system requires the operator to boot up a DOS based computer operating system to access the projector controls. This will be replaced with a key on/ off switch and lots of manual controls. Projector controls will also be automated through Screenmaster and Microstar.

If you pass through Jacksonville, Florida stop in, see a show, and crawl around our dome. Call ahead so I can sign you up as



Mike Cutrera

Patrick McQuillan
Author
Alexander Brest
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1025 Museum Circle
Jacksonville, FL 32207

November.

The Alexander Brest Planetarium opened in fall of 1988. The Planetarium has a 60 foot diameter dome, 215 uni directional seats, video projection (60 ft diagonal screen), an allsky system, cross fading seven section panoramas (with a 25% overlap), projector stacks, a Jenoptik RFP DP3 star projector, and at least one of every special effect projector ever made by Sky Skan.

Only seven Jena DP3s were ever made. One of them was destroyed by retreating Iraq soldiers who burned the Kuwait planetarium and museum. We have the only one in the western hemisphere. It projects 8,900 stars. Many special effects are built into the planetarium projector such as: a 360 degree panorama system, cloud projector, compass directions, and sunrise/ sunset glow to name a few.

Previous to the current planetarium, the Museum of Science and History had a 30 foot diameter planetarium with a Minolta MS 10. The Mark Smith Planetarium in Macon, Georgia is currently benefitting from that star projector in their theater. The old dome is still in place, although all the seats and related planetarium systems have been long removed. It serves now as

Small Talk

Hedgesville High and Berkeley County Planetarium are empty, and sounds echo through the hallway. Just a few days ago, dozens of teachers descended on the planetarium for teacher workshops.

A week ago the halls were filled with students, and I said good bye to Da Boyz. Both piled up awards at Step Up Day festivities, the day each class steps up a grade level. They donned caps and gowns for graduation at Shepherd College's athletic arena 12 miles from Hedgesville. This was the first time we ever held graduation outside Hedgesville High. We've outgrown our gym, and facilities at Shepherd College allow our graduates to invite more relatives and friends without being cramped.

It's hard to believe Da Boyz are gone. The two years they've been planetarium assistants, time has flown! It was only yesterday Frank forgot the name of the North Star (Ms. Wasiluk, I know that's an important star, but I can't remember its name!) or Matt was saying assuredly,

That's Andromeda, Ms. Wasiluk, and don't tell me I'm wrong! I gently removed the pointer from his hand and said, O.K., I won't, but over here is where the constellation of Andromeda is really located.

From those rough beginnings Da Boyz slowly took over more tasks while furthering their astronomical knowledge. They entertained waiting groups with movies and activities when the planetarium couldn't hold everyone. Da Boyz would do astronomy activities with elementary students at science camp. They'd also handle open houses scheduled during parent teacher nights, take slides for programs, and enter future programs in the computer. This year they kept close watch on (minimal) sun spot activity, entered the Earth & Sky radio competition, submitted art to the Space Student Involvement Program sponsored by NASA and NSTA, and sent observations of variable star Mira to AAVSO. Janet Mattei awarded the boys their own letters to use for future observations.

In light of their leaving, Da Boyz have left a few words to pass along to all of you, so here are their final thoughts on the last two years.

From Frank Aliveto:

As I finish my last few weeks of planetarium work, I look back on my accomplishments here with mixed emotions.

When I leave school, it will probably be the last time I take in a program when I am actually at the helm. From now on I will watch programs as a mere civilian and quietly think about what I might have done or said differently. When I say my sad good bye, I am leaving a small part of myself in the planetarium.

On the other hand, when I think back on all those hectic programs, stargazing projects, Sun observing, and a myriad of other activities Ms. Wasiluk, Matt, and I have done together, I'll remember fond times with friends where we turned work into a fun and exciting adventure.

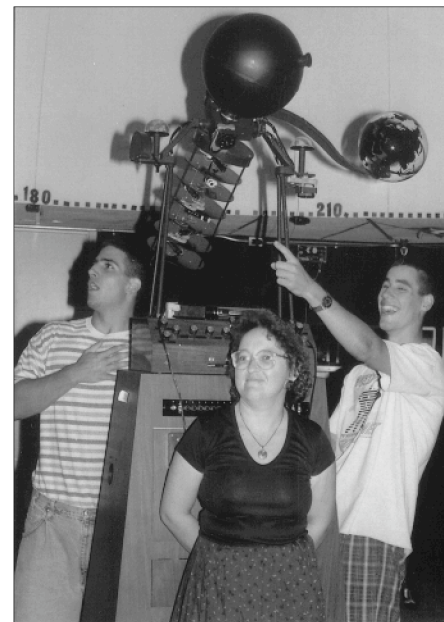
From Matt Yost these parting words:

I sit here pondering the fact that my high school career is over. If I were to look back on my experiences in twenty years, a fond memory would be working endless hours in the beloved planetarium. These experiences will weather me for upcoming adventures. Planetarium life is vigorous and demanding. The time I spent will enlighten me and broaden my horizon.

They're gone Frank to West Virginia University on a full football scholarship and Matt to Virginia Tech on a partial track scholarship. I'll miss them, but not that much! Now I can tackle boxloads of piled up work. Here's hoping!

While Betty looks on, Frank (left) and Matt (right) express the wonder and joy planetarium work has brought them.

Elizabeth Wasiluk
Small Talk Editor
Berkeley County Planetarium





Jalie Phifer
Morehead Planetarium
Chapel Hill, NC

Global Mythology, Part 3: The Summer Constellations

Global Mythology will be serialized in four parts within the 1996 issues of Southern Skies. Fall and circumpolar constellations plus a bibliography will appear

AQUILA

1. (GREEK): Aquila the Eagle was the pet bird of Jupiter, king of the gods. One day, Jupiter sent Aquila down from Mount Olympus to find a young man to serve the wine at the table of the gods. Aquila flew down over the Earth, and spotted a young man named Ganymede, outside keeping his father's flocks. Aquila was a very large eagle, and he swooped down and picked up Ganymede with his talons and flew him all the way back to the top of Mount Olympus. Ganymede became the celestial waiter of the gods, and was popular with everyone. (P. 179 The New Patterns in the Sky)
2. (INDIA): To the Hindus the world was created by Brahma, destroyed by Shiva, and preserved by Vishnu. The Hindus saw in Aquila the footprints made by Vishnu as he walked among the stars. Meanwhile, the Jaina of India saw in the three brightest stars of Aquila a pikolan, which is a two basket shoulder yoke. This type of yoke was often used to carry food and goods back and forth from the market. (P. 180 The New Patterns in the Sky)
3. (CHINA, JAPAN, and KOREA): Once upon a time, there was a beautiful princess, named Tchi niu, daughter of the Sun king. She was famous for weaving the most magnificent, multicolored tapestries in the kingdom. In time, Tchi niu fell in love with a hard working herdsman named Kien niou who worked for her father. When Tchi niu said that she must marry Kien niou, the Sun king was delighted that his daughter would desire such a fine, young man for her husband. The Sun king arranged the wedding. Tchi niu wove herself a dazzling wedding dress from starlight and dewdrops, and the two were united in marriage.

During the following years, Tchi niu and Kien niou lived together in the greatest of happiness. They laughed and played together, full of love. Unfortunately, they got so carried away with each other that they began neglecting their royal responsibilities. Tchi niu stopped creating her fine tapestries and Kien niou let the cattle run wild. The Sun king gently admonished the couple, reminding them of their duties. They promised to get back to work... and at first, they did. But after a while, the two again were back to playing all the time instead of working.

This happened again and again. Finally the Sun king had had enough. He banished the lovers from each other, placing them on opposite sides of the Milky Way in the sky. Tchi niu became the bright star Vega while her husband became the star Altair. He granted them permission, however, to visit each other one day a year, on the seventh day of the seventh month, if they could find a way to cross the great river of heaven, the Milky Way.

Because Kien niou was mortal, he had no magical powers to get across the Milky Way. However, Tchi niu was a goddess. Tchi niu summoned the magpies from all over the world to fly up to the sky. When they came, she had them form a bridge over the Milky Way that she could walk across to her husband. Supposedly, if it rains in the evening of this special night, the lovers are crying with joy to be together again. Likewise, if it rains the morning after, the lovers are said to be shedding tears that they must part for another year. The Japanese say that on that night, their two stars sparkle with five colors. (P. 103 104 Stars of Jade, P. 185 186 The New Patterns in the Sky, and P. 232 233 The Glorious Constellations)

4. (ARABIC): Al Nasr al Tair, meaning The Flying Eagle, sometimes the Raven or Crow. (P. 95 The Constellations, how they came to be)
5. (TURKS): The Hunting Eagle (P. 95 The Constellations, how they came to be)
6. (PERSIANS): The Star Striking Falcon or Flying Vulture (P. 95 The Constellations, how they came to be)

Persians also saw Aquila as an eagle. In one of their stories, the Sultan Schemiram was outside on one of the towers of his castle one day with his son Behiram and other officials when a great eagle began flying in circles over his head. He could see a serpent wound around the neck of the eagle, strangling it. The Sultan commanded that his best archer kill the serpent without hurting the eagle. His son shot an arrow and, with expert aim, accomplished the task. The snake fell to the ground and the eagle circled once more, in gratitude.

The next year, the eagle came and dropped seeds at the feet of the Sultan from the sky. The sultan planted the seeds, and a strange plant grew from them with large fruits that were full of an exotic liquid. The sultan and his court officials realized that this liquid was some kind of drink, but they did not know if it was poisonous or not. So the court officials gave some to a prisoner who had been sentenced to die. The prisoner drank the liquid and began dancing and singing, and happily drank until he fell asleep. When he awoke, he described how much he enjoyed the drink, which turned out to be wine. The sultan decided to grow many of these new plants in his gardens. (P. 234 The Glorious Constellations)

LYRA

1. (GREEK): Lyra was the tortoise shell lyre (harp) owned by a man named Orpheus, who played lovely, enchanting melodies on this special instrument. One day his beautiful wife, Eurydice, was outside walking in their garden when she was bitten by a poisonous snake. Eurydice died and went to the Underworld, ruled by Pluto. Now, Orpheus was very upset and he journeyed down to the dark realms of Hades in search of his wife. Orpheus pleaded with Pluto to allow Eurydice to come back home to live with him again in the Upperworld, but Pluto refused.

So Orpheus began playing his harp. The notes were so enchanting that even cold hearted Pluto was touched. Pluto finally gave Eurydice permission to go home with her husband on one condition. Orpheus must play his harp as he walked out through the caverns of the Underworld to the Upperworld, and Eurydice would

follow as long as he did not look back. This seemed easy, so Orpheus agreed. He began playing, and sure enough, his wife silently followed. After winding through the long, dark corridors of the dead for some time, he finally reached the edge of the Upperworld. But at that moment Orpheus panicked, and he glanced back just for a second to see if Eurydice was really there. She was, but because he had disobeyed Pluto, she was forced to return to the Underworld forever. Disconsolate, for the rest of his life Orpheus played sad, sweet songs in her memory. (P. 184 The New Patterns in the Sky)

2. (PERSIAN): Lyra was The Tortoise in the 900s A.D. and a clay tablet in the 1200s A.D. (P. 185 The New Patterns in the Sky)
3. (ROMAN): Lyra was a vase or a lyre. (P. 185 The New Patterns in the Sky)
4. (ANCIENT): The lyre was made from a tortoise shell, with strings stretched across it. It was called Chitara or Kitara, which means turtle, from which the word guitar comes. (P. 185 The New Patterns in the Sky)

CYGNUS

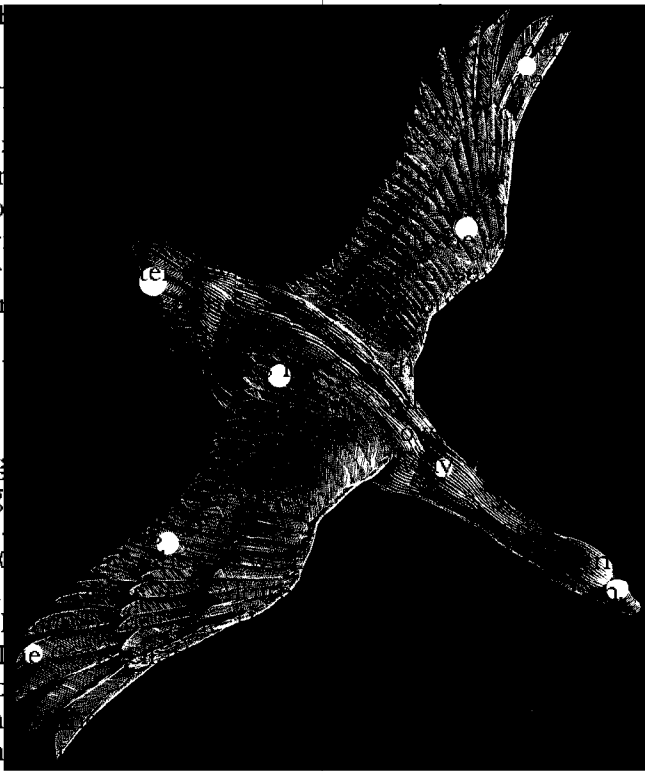
1. (GREEK): Cygnus the swan was once a human, who had a friend named Phaethon. Phaethon was the son of Helios, the god who drove the sun across the sky in his chariot every day. One day, Phaethon asked Helios to prove to the world that he was really his father, because some people did not believe it. Helios said that Phaethon could have one wish. Delighted, Phaethon foolishly asked to be allowed to drive the sun chariot across the sky.

Immediately, Helios tried to discourage his son from such a dangerous ride. But Phaethon was stubborn and got his way. When he tried to drive the fiery chariot, the four strong horses realized that their new driver knew nothing about what he was doing. So the horses ran wild, dragging the sun in great loops and zig zags all over the sky. They came too close to the Earth, and the Earth was burned by the scorching heat of the sun. Then they raced too far away, and the Earth became bitterly cold.

When Jupiter, king of the gods, saw what was happening, he was filled with

anger. He hurled a thunderbolt at Phaethon, knocking Phaethon to the ground. Phaethon fell to the River Eridanus. Cygnus was filled with grief when he saw that his friend had fallen down to the bottom of the river. Phaethon's dead body was given a proper burial and devotion to his friend. Cygnus by changing into a swan and placing himself in the sky for all to see. (P. 100 The Sky, etc.)

- (ARABIC): Cygnus is called Al Dajaj al Minhar al Back. (P. 58 Tales of the Stars)
- (CHINESE): The constellation Tien Tsin, marked by the stars of Cygnus, was



- (ALEUTIAN ISLANDERS): These arctic people saw Cygnus as an Eskimo kayaker going down the great river in the sky, the Milky Way. The kayak stretches from Deneb to Albireo, while the Eskimo's double-bladed paddle is held crosswise, marking the other two bright stars of Cygnus. The Eskimo is a seal hunter. The Aleutians have a poem about these stars:

The men fashion the frames of their kayaks,
The women, together, sew on the skins,
Sew with ivory needles, or needles of rabbit teeth.

The men set off, some to hunt walrus,
And a seal hunter dips his double-bladed oar
Into the freezing water,
Sends his kayak down the sky's icy river.

- (Poem #10 The Stars are Silver Reindeer)
- (NATIVE AMERICANS): Long ago, there

was a peaceful lake within a forest. In the forest could be seen a peaceful lake within a forest. In the evening, just as the sun was setting, three hunters came to the lake. When they saw the tree branches covered with snow, a noble creature appeared. Just then, the hunter wanted to shoot it. Two tried to stop him. One noble creature flew upwards from the lake. The hunter that wanted to shoot it drew his bow and arrow, but the bird before it flew away.

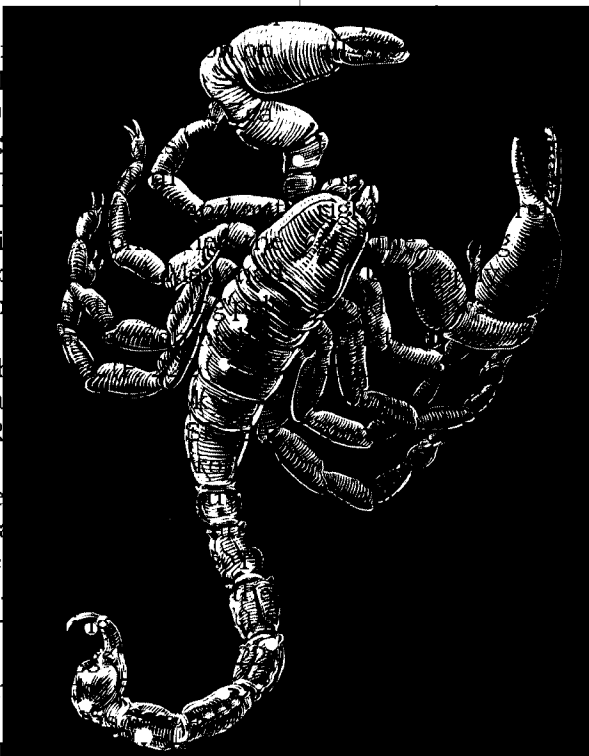
SAGITTARIUS

- (GREEKS): Sagittarius was the archer, a half man, half horse who was skilled at hunting. After Scorpius the scorpion bit Orion on the heel, Sagittarius avenged Orion by killing the scorpion with his bow and arrow. The stars of the arrow point toward Antares, the bright, red star in the heart of the scorpion. Although Sagittarius is sometimes called the centaur, he should not be confused with the real centaur of the sky, Centaurus, who shines brilliantly in the skies of the Southern Hemisphere.
- (EGYPT): Sometimes the Egyptians saw this as a swan, an archer, or an ibis. (P. 89 The Constellations, how they came to be)
- (INDIA): These stars were seen as a lion and an elephant. The handle was the lion, and the spout was the elephant. (P. 214 The New Patterns in the Sky)
- (CHINA): The Chinese saw the western half of the teapot shape of Sagittarius as Teou, the Southern Bushel. (The Northern Bushel was the Big Dipper.) This bushel was hollowed out of wood, while its handle was made from a tree branch and fastened to it. Early in November, when it was time to harvest the rice crops, the Southern

Bushel would cross high overhead at midnight, signalling to the Chinese that the rice should be brought into the storehouses. Rice was measured by the bushel, and that is how this group of stars got its name. Sometimes Teou was also known as a wine cup, because after the people had finished harvesting the rice, there was traditionally a time of celebration where people would make merry. (P. 75 Stars of Jade)

SCORPIUS

1. (GREEK): Scorpius the Scorpion sparkles brilliantly in the south during the summertime. His s shaped body is unmistakable. The Greeks believed that he was sent by the Earth goddess, Gaia, to bite Orion when Orion threatened to kill all the animals on Earth. Scorpius went after his target and inflicted his poisonous bite upon Orion's heel. Although Orion was a great giant, the scorpion's poison was too strong for him, and he died. Fortunately, Ophiucus the Snake Charmer had a magic potion, which he used to bring Orion back to life. Now Orion and Scorpius are mortal enemies, and they stay as far as possible. The opposite sides of the
2. (NEW ZEALAND): New Zealand said that a fishhook that the pull up the island of the ocean in a hook broke free of been pulling so hard that it snapped and shot up to the 224 The New Patterns in the Sky)
3. (DAYAK OF BORNEO, MALAYAN, AND CHINESE): These palm tree in the the foot of this palm also saw a goose palm tree leans to a goose, so that a goose not harm her or The New Patterns in the Sky)
4. (EAST INDIES):
5. (TUKANO, KOBLEN, BUSH, DANIEL): Scorpius was The Great Serpent, his mouth opened wide. (P. 225 The New Patterns in the Sky)
6. (BAKAIRI, SOUTH AMERICA): Scorpius was a mother carrying her baby on her



- back. (P. 223 The New Patterns in the Sky)
7. (MARSHALL ISLANDS): These Pacific people said that Scorpius was Dumur, the oldest son of the mother of all the stars. They said that long ago, the mother of all the stars was Ligidaner, the bright star Capella. She had many sons, Dumur (Antares) being the oldest and Pleiades being the youngest. One day, while visiting their mother, the sons decided that whoever could reach a certain island the fastest would be the King of the Stars. The two sons fervently prepared their canoes for the race.

Now Ligidaner asked her oldest son to let her ride in his canoe. Dumur refused because he didn't want all her baggage to weigh down his canoe. So she asked her other children, but each of them refused as well, wanting to win the race.

Finally, Ligidaner turned to Pleiades, who welcomed her. She instructed him how to fasten each strange piece of her baggage to different parts of the canoe. Pleiades did, even though it seemed unusual to him.

When the race began, Pleiades was canoe raced ahead of baggage turned out being ever used, and canoe far ahead of it finally caught up Dumur then used his to order Pleiades to to him.

Pleiades obeyed him. But out to put up such and the sailing canoe yardarm of the sail, with it into the ocean

y toward the island. ad to attach the sail use it, now that the that is why he has a e Dumur made it to had already beaten g of the Stars.

He declared that he never longest brother again.

Now the two are forever on opposite sides of the sky, Pleiades rising while Antares sets, and vice versa. (P. 221 222, 223 The New Patterns in the Sky)

8. (WASCO NATIVE AMERICANS OF

THE NORTHWEST): The Wasco Native Americans had a legend about the two stars at the tail end of Scorpius. They said that long ago, all the animals and people spoke the same language. Coyote was more powerful than any other animal on Earth. He had the ability to change into a human, and on one of his trips down the Great River (which we know as the Columbia River), Coyote took the form of a handsome young man. As he was canoeing down the river, he spotted a beautiful girl in one of the villages. Coyote put together a valuable gift of many furs and took it to the girl's father, asking for her hand in marriage.

Now, the girl's father was the chief of the village, and he said that he would not trade his daughter for a pile of furs like other fathers. The young hunter would have to win his daughter's heart. Coyote came back, day after day, each time bringing a small present for the girl. But she was shy, and after accepting his gifts, she would run to join the children playing

At last Coyote showed the Chief what he might do for his daughter. The Chief suggested that Coyote tell her what she would get for joy, so when she came out of the forest, Coyote asked her what her heart desired the most.

The girl answered that she wanted a private pool to bathe in, hidden from those who might spy on her. Coyote promised to return in seven days, and immediately went to work. Coyote climbed the trees, cut through the hills beside the river, repositioned a wall of rock, and made a new stream well up out of the Earth. After much

work, he had created a waterfall that spilled over the top of a tall, inward slanting wall of rock, creating a hidden pool behind the spray.

Having accomplished his work, Coyote returned to the village, inviting the girl and her father to come see his creation. Both

were impressed with the waterfall. Then Coyote led them behind the falls to the pool. The girl was pleased and said she would marry Coyote. After the two were married, the girl went to bathe every morning in her new pool. She loved the privacy and its beauty. Coyote would wait for her outside the waterfall's screen while they sang to each other in happiness.

Unfortunately, there were two old busybodies who spoiled everything. These busybodies were grandmothers who sat atop of the tallest mountains on either side of the river. When they talked, their voices could be heard all over the Rocky Mountains. They could see everything that people did, and announced to everyone far and wide what everyone else was doing. When the grandmothers saw the two laughing and singing, the grandmothers laughed at them and told everybody what they were doing.

Soon all the people were laughing at Coyote and the girl. The shy girl became unhappy. She jumped into the river and let it carry her away.

At last Coyote went after her in a swiftly, he caught her just before she would be carried out to sea. At this point, they were changed into little ducks, paddling on the water. Even to this day, just before the last rays of sunlight disappear from the cliff on the south side of the Columbia River, it is said that a flock of summer ducks fly out to look at the series of waterfalls that flow down the mountain. The longest at the very top, which hides the girl's

When all is quiet, it is said you can hear the song of the girl that softly wafting across the (voices of the Winds)



Astro-Video Review

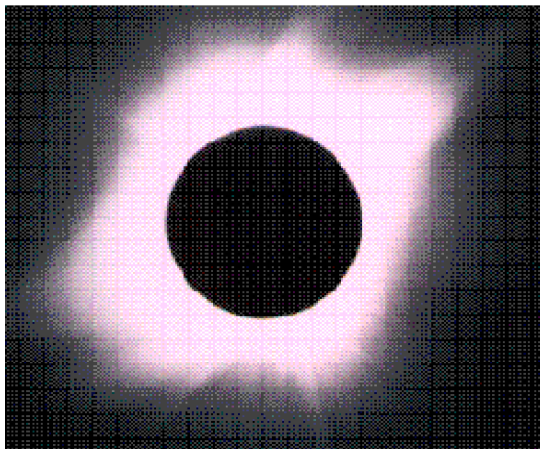
Universe: The Infinite Frontier

The series title *Universe: The Infinite Frontier* gave me the impression this film was going to be about the universe. All this preview film covered was The Sun and things related to the Sun. I was expecting to hear about the planets, but there was no information on them in the program.

Music begins tinkling in the background, and then a beautiful picture of the solar system emerges. This was a great way to start, but from there it plummeted down hill.

The average viewer would probably understand the first few seconds of information. When the narrators started using terms like solar spectral lines, however, I got lost. A student watching this program would definitely have to know something about astronomy and solar physics in advance. It's certainly not an introductory program.

Graphics were decent, and the music went well with the graphics.

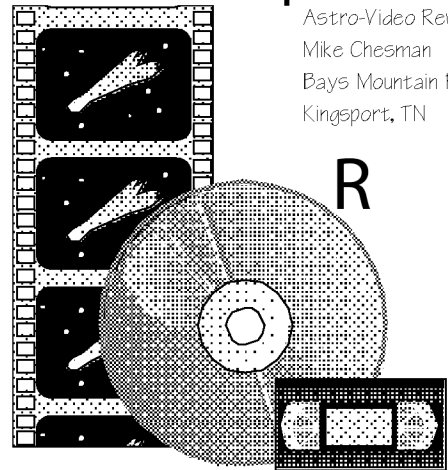


(This film borrowed heavily from the 1978 NASA film *Universe*. It contained many sequences anyone who has viewed the William Shatner narrated film would immediately recognize. Ed.)

There were several narrators, instead of just one. This could be either good or bad. It is good to hear a totally different person, but it can get annoying. They would basically let one speaker say a line, and then get another speaker to finish what he or she was saying. After one rotation of narrators got done, they would simply go back to do another rotation. For an 18 minute video, four speakers did not seem necessary.

I did like the fact that the video went back and told about mythology. It showed how things in the universe were related to stories in mythology. The information, even when understandable, was way too much for an 18 minute video. When the video was finished, I felt like I had not learned anything. There was too much technical information for anyone being exposed to this material for the first time to grasp in such a short span.

INTELECOM has single videos for \$49.95; it's \$889.95 for the entire series. Call 800 576 2988 for more information.



Astro-Video Review Editor
Mike Chesman
Bays Mountain Planetarium
Kingsport, TN

Kismet Kerley
Sophomore Intern
Craigmont Planetarium
Memphis, TN

(Kismet's picture will be available when we get our new QuickTake 150 digital camera. —Ed.)

Cruise to the PPA Fall Meet-

Fleischmann Planetarium at the University of Nevada Reno will host the Pacific Planetarium Association meeting October 10-12, 1996.

Headquarters for the conference will be the University Inn, an on campus residential and dining facility. Some paper sessions and meals will be at the Inn, while

other activities will be at the Fleischmann Planetarium Theater.

Highlights will include demos of their new Pioneer Linear Loop 8/70 motion picture system, an original star show *Cosmic Conclusions*, and a cruise on Lake Tahoe.

Call JoAnne Black at 702 784 4812 for

Book Review: Making and Enjoying Telescopes: Six Complete Projects and a Stargazer's

Patrick McQuillan
Book Review Editor
Alexander Brest Planetarium
Jacksonville, FL

Making and Enjoying Tele-
scopes:
Six Complete Projects
and a Stargazer's Guide

by Robert Miller
and Kenneth Wilson

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Reviewed by
Richard McColman
Morehead Planetarium
UNC-Chapel Hill
Chapel Hill, NC

Richard McColman takes a break from his usual topic of special effects to review a book. Richard writes as well about ink on paper as he does about glass, motors, and light bulbs.



Most books on telescope making must be intended for folks who want to spend the rest of their lives grinding optics and fine machining elaborate equatorial mounts. Not Making and Enjoying Telescopes! This book is aimed at average people who have an enthusiasm for the sky and a desire to construct a first rate astronomical instrument with just a few evenings work. The projects in this volume require only a few run of the mill tools, readily available materials, and average mechanical skills.

As I first scanned and then read through this book more thoroughly, I was impressed with just how approachable the subject of amateur telescope making is presented to the uninitiated reader. By first covering a brief history of telescopes (along with an occasional humorous account of some of the pitfalls and breakthroughs of the early telescope pioneers), then presenting an equally brief and low tech, but lucid, look at the inner workings of telescope optics and mounts, the authors effectively teach the inexperienced would be telescope builder the basic concepts of scope anatomy. And, amazingly, they do it in a mere 16 pages, without all of the

intimidating equations and formulae found in most other texts on the subject

In just an hour or two, even an optical idiot is well on his/her way toward understanding the how and why of telescope design before later plunging ahead with specific construction plans.

One pleasant surprise is that Miller and Wilson do not cover the excruciatingly, laborious procedure of mirror grinding. Given the current abundance of high quality, economical, commercially made telescope mirrors these days, scope builders no longer must endure countless hours of grinding, figuring, and polishing optical blanks. Besides, most of the commercially available optics are now priced at little more than the materials necessary for the at home grind (pun intended). Wisely, the authors avoid wasting valuable pages and reader attention on this near masochistic procedure.

Instead, the book concentrates on the more user friendly aspects of Newtonian telescope construction building the primary mirror cell and secondary mount, the tube, the scope mount, and in a couple of projects the focuser. Out of the five telescope projects covered in detail in the book, there are two 4 $\frac{1}{4}$ inch rich field reflectors (one with a classy looking octagonal stained and varnished, walnut wood tube); two simple equatorial mount reflectors a 6 inch, $f/3.3$, and an 8 inch, $f/5$; and, finally, a 10 inch, $f/6$ Dobsonian.

There s also a simple barn door camera tracker project for astrophoto aficionados. In addition, there s a goody included in the form of a truly portable (It can be taken onto a plane as carry on luggage.), 8 inch, $f/4.3$, dual truss tube scope built by Columbus, Ohio amateur astronomer Ron Ravneberg. Though detailed plans for this particular scope aren t included, it s neat to see a functional instrument which is also a truly aesthetic work of art.

It and a dozen or so other scopes color photographed in backyards and at star parties serve as a treasure trove of telescope ideas for slightly more adventurous scope builders. Together, this scrapbook of photos can inspire the imaginative

tinkerer to go beyond the six step by step projects, and take a stab at some creative variations in telescope design. And aside from its how to aspects, this book is very attractive to look at unlike most similar subject texts I've seen.

In addition to all this, the authors provide a chapter on telling the difference between essential scope accessories and those that are merely nice black holes to pour money into, as well as a guide on how to avoid getting burned when purchasing telescope components. Of course, there's the obligatory chapter on telescope adjustment and maintenance, including a no nonsense guide to checking for optical aberrations. There's also a short introduction to the very exciting world of astrophotographic equipment and techniques. (A complete look at that esoteric subject would require an entire book by itself)

Besides valuable step by step construction procedures and some pretty color pictures, Miller and Wilson have included at the end of the book a resource list which includes citations for related amateur astronomy books and magazines, as well as suppliers of optics and other telescope parts. That alone is worth half the cost of this text.

The only possible fault one might find with *Making and Enjoying Telescopes* (aside from a handful of misspellings I guess the editor must have forgotten to run the spell checker!) is the relatively small emphasis given to actually observing with the telescope. That's not really what this book is all about, and consequently,

I didn't find that aspect of it objectionable.

On the other hand, I was glad to see the authors' emphasis on getting new telescope users acquainted with the operation of their instruments before attempting astronomical observing the pitfall that all too often frustrates novices into abandoning their scopes before they even get started.

Users are instructed not to attempt initial viewing in a night sky environment, but instead become familiar with their alien gear in broad daylight where they can actually see the various parts, practice

how to aim the instrument at TV transmitter towers and the like, and get the finder scope aligned. The number of frustrated people I've personally gotten from anguished new telescope owners convinces me that these few short paragraphs are a wise addition for the inexperienced scope owner.

Making and Enjoying Telescopes is a valuable telescope making resource for novices and an enjoyable read with occasional dashes of dry wit. It's light on technical jargon and mathematics (the simplified optical formulae in the entire book fill only a page or two) a welcome relief from dry

texts crammed with pages of indecipherable equations and jumbled diagrams. This approachable style will inspire even the greenest astro hardware novices to dive into building their own scopes right away.



Evolution of Planetary Atmospheres

Dennis Joseph Cowles
Louisiana Nature Center
New Orleans, LA

A paper presented at the
1996 conference of the
Southeastern Planetarium
Association
June 19, 1996

Anyone analyzing the atmospheres of various planets notices that there are differences in composition. Jupiter, for example, has an atmosphere that is almost identical to the composition of the Sun. Earth's atmosphere is predominantly molecular nitrogen while Mars and Venus are dominated by carbon dioxide. Why do different planets have different atmospheres? How is it possible that planets have wide differences in atmospheric composition if they formed from the same cloud?

General Discussion

The main forces that govern the atmosphere of a planet are gravity and temperature. The gravity determines the minimum velocity needed by a molecule to escape from a planet and the temperature is a measure of the average velocity of the molecules. The atmosphere of a planet reflects a balance between these two forces.

What is the minimum velocity that a molecule must have to escape from the atmosphere of a planet? This is the escape velocity for that planet. The equation for it is derived from Newton's Laws.

$$v_{\text{ESC}} = [(2 \cdot G \cdot M)/r]^{0.5}$$

The velocity v_{ESC} is given in m/sec, G is Newton's gravitational constant ($G = 6.67206 \times 10^{-11} \text{ m}^3/\text{kg} \times \text{sec}^2$), M is the mass of the planet in kilograms, and r is the radius of the planet in meters. Notice that the escape velocity decreases with increasing distance from the planet; it is easier to escape from an altitude of 5000 meters than it is from the surface. An appendix attached to this paper lists the escape velocities for the planets and some of the major moons.

Now we know what minimum velocity is necessary for a gas to escape. What is the velocity of the molecules? There is a formula from the Kinetic Theory of Gases that describes the average velocity of gas molecules at a given temperature.

$$v_{\text{RMS}} = [(3 \cdot R \cdot T)/m]^{0.5}$$

The root mean square velocity is given in meters per second, R is the Gas Con

stant ($R = 8.314 \text{ J/K mol}$), T is the temperature of the gas in Kelvins, and m is the molar mass of the gas (in kg/mol). [The molar mass of a chemical element or molecule is the mass of 6.023×10^{23} of those particles (molecules, etc.). This has been determined for most elements and is listed on any periodic table. To determine the molar mass of water, for example, we look at the chemical formula (H_2O) and add up the molar masses of the individual components. For water, $m = (2 \cdot \text{mass of H}) + (1 \cdot \text{mass of O}) = 2 \cdot 1.008 + 16.00 = 18.016 \text{ g/mol} = 1.8 \cdot 10^{-2} \text{ kg/mol}$.]

The RMS velocity for a given gas is the most probable velocity of any particle in the gas chosen at random. Most of the gas particles are travelling at velocities that are at or fairly close to the RMS velocity; some, however, are travelling much slower; some, much faster. Always keep in mind that the RMS velocity is an average taken over many particles.

In most cases, the RMS velocity of a gas will be lower than the escape velocity of the planet. Comparing the RMS velocities of two gases will tell us which gas is preferentially lost from an atmosphere to space: higher RMS velocity equals preferential loss. At room temperature (298 K), helium (He) has a RMS velocity of 1360 m/sec; molecular nitrogen (N_2) has an RMS velocity of 515 m/sec at the same temperature. The escape velocity from the surface of the Earth is some 11,200 m/sec. It is no surprise that Earth's atmosphere has only traces of helium but has an overwhelming abundance of N_2 . The only helium that is retained by Earth consists of those atoms that are moving at a much lower rate than the RMS velocity and the only N_2 that is lost to space are those molecules that happen to be moving much faster than the RMS velocity. A useful rule of thumb is this: if the RMS velocity for a specific gas is 20% or more of the escape velocity for the planet then that gas will escape.

The long term composition of a planetary atmosphere depends on the balance between the velocities of the molecules and the minimum velocity that those molecules need to escape. Different planets hold on to different gases because of differences

in temperature, gravity, and the types of gases that were present originally. Jupiter has a composition that closely matches the abundances found in the Sun. Jupiter and the Sun formed from the same cloud and both possess enough gravity to keep gases from escaping (even at very high temperatures in the case of the Sun).

Origin of the Atmospheres

Understanding something of the origins of planetary atmospheres helps to understand the evolution of those atmospheres over time. The so called gas giant planets are composed of the gas from which the solar system formed. Their overall composition is very similar to the percentages of the elements found in the Sun. Terrestrial planetary atmospheres, however, are a bit different.

All rocks can trap gases to some extent, either by trapping gas in the matrix of the rock when it forms or by physically trapping it onto the surface of the rock (adsorption) at some later time. Meteorites are no exception to this. Meteorites can be divided into two categories: gas poor and gas rich. The gas poor meteorites have isotopes that are very similar to the isotopes that are found in terrestrial planetary atmospheres; the gas rich meteorites have those same isotopes, but they also have another gas component that is very distinctive it matches the isotope ratios in the solar wind (and presumably, of the Sun itself). Gas rich meteorites have a lot more gas adsorbed on their surfaces than the gas poor ones (thus the name). The enrichment of gases on the surfaces of the gas rich meteorites is due to the fact that they have been exposed to the solar wind for billions of years. There was no solar wind at the time that the solar system formed, so the terrestrial planets must have formed from the accretion of gas poor planetesimals. For the terrestrial planets to show the isotope ratios that are seen, the atmospheres of the terrestrial planets must have formed after the planets themselves formed. In other words, terrestrial planetary atmospheres were outgassed from the interiors of the planets. The initial composition of any terrestrial atmosphere depends upon which gases were trapped in the planetesimals from which the planet formed.

The interior of the Earth is filled with molten rock that has gases trapped in it. When a volcano erupts, it releases those

gases into the atmosphere. Vulcanologists have detected many different gases being emitted from volcanoes: molecular nitrogen (N_2), carbon dioxide (CO_2), hydrogen chloride (HCl), hydrogen fluoride (HF), hydrogen sulfide (H_2S), water vapor, and trace amounts of other gases (helium, argon, krypton, etc.). The ultimate source of the air that we breathe is volcanic eruption.

The atmosphere of Jupiter formed directly from the solar nebula; it is the same now as when it formed. Saturn probably has an overall composition that matches its original composition. Saturn's upper atmosphere seems to be depleted in helium relative to Jupiter. Based on the mass and the overall density of Saturn, planetary scientists are sure that the helium is there but that it resides in the core of the planet.

Uranus and Neptune may have rocky cores and may thus be considered semi gas giants or super terrestrial planets, depending upon one's point of view. In either case, they have enough mass to prevent any substantial loss of gas to space. Uranus and Neptune do not have the same atmospheric composition as Jupiter or Saturn; they do not have ammonia (although some authors claim that ammonia is present in Uranus' atmosphere) but they have a superabundance of methane 20 times the cosmic abundances. Uranus and Neptune both have a lot of water, as well. According to the current models for the interiors of the two planets, there are large oceans of ionic water underneath the clouds. These oceans are something like 10,000 km deep! These oceans dissolve gases like ammonia and hydrogen but reject helium and methane. This model is very appealing because it explains the both lack of ammonia and the great abundance of methane. It is possible that the initial compositions of Uranus and Neptune were the same as for Jupiter and Saturn, but many of the original constituents are now hidden in the oceans under the clouds. The superabundances of methane are due to the fact that the ionic oceans reject that particular gas. Methane is not really more abundant in Uranus or Neptune just more visible.

Sample Calculations Using Molecular Hydrogen

Hydrogen is the most abundant element

(continued on page 22)

News from SEPA States

George Fleenor
Bishop Planetarium
Bradenton, FL

Bishop Planetarium, Bradenton

The Bishop Planetarium continues to stay busy, during the summer months. Each day hundreds of camp troops visit the facility. A typical tour consists of a tour through the museum, a visit with Snooty (our resident manatee), and a star show of their choice.

Family star shows are also presented every Saturday morning at 10:30 a.m. followed by hands on museum activities. The featured children's show during July was Loonies Moon, an original production of Bays Mountain Park. Larry Cat in Space will be the featured children's show in August. The Summer public star show features Quick As A Flash, a program which was produced jointly with Bays Mountain Park. This tour of the Solar System has proven to be very successful with summer audiences. The show is presented daily at 1:00 p.m. and 4:00 p.m.

A matinee laser show is presented daily at 2:30 p.m. This year we thought we would do something different for Summer audiences. The Summer matinee features Surf's Up, a collage of Beach Boys, Jimmy Buffett, Bob Marley, Jan and Dean, etc. This 35 minute laser show has been a big hit with the young and old alike!

Skies Over South Florida is presented every Friday and Saturday evening at 7:30 p.m. The program features star shows which deal with observational astronomy and includes a live tour of the evening sky. Firefall is the featured program this summer, with an emphasis on the upcoming Perseid meteor shower. The program also includes admission to the Tonite Show. The Tonite Show, which begins at 8:30 p.m., (weather permitting) features the Bishop Telescope and Observatory. The observatory continues to open every Saturday morning from 11:30 am - 1:00 pm for solar observing.

The new admission policy which was instated February 1st has had a major impact on attendance. Museum patrons are admitted to all Planetarium presentations, manatee presentations, and museum, for one low admission. This is for daytime programs only! Evening admission is still sold separately. This has made admission

to the facility a better value and helps simplify the extensive schedule of programs which are offered.

Laser shows continue to run every Friday and Saturday evening at 9:00 p.m. and 10:30 p.m. Two different shows are featured each week. We still are striving for complete ILDA compatibility and are hoping to eventually make laser shows available for purchase.

The museum and planetarium will be closed the first week of September for our annual maintenance. When we reopen we will feature Adler Planetarium's Comets Are Coming. Plans are also in the works for a major media blitz and spectacular events for the upcoming lunar eclipse in September. More on that later! If anyone really has to know sooner, feel free to call me anytime!

Alexander Brest Planetarium, Jacksonville

Patrick McQuillen reports that with summer comes the busy time. Extra hours of daylight, extra visitors, and of course, extra programs. Our Summer schedule has us running programs from 11 am to 4:30 pm, with an occasional program before 11 am. We are busy finishing up details for the grand opening of our Challenger Learning Center in August. It is a rather unique situation. The public school system owns the center (it is located in an elementary school 10 minutes from the planetarium), and they have contracted with the Museum for us to provide staff to run the program.

We will be celebrating Spaceweek on July 20. Our event will have all the usual stuff: planetarium shows, solar viewing, face painting, moon rocks, etc. We are also getting ready to install a new star projector control system (a la JHE) this September. Plans are already underway for an evening event at the Planetarium for the total lunar eclipse on September 26.

Orlando Science Center, Orlando

Paul Trembly reports construction on his facility continues on schedule with about 95% of the building's exterior and 70% of the interior complete. Installation

of the 79 Spitz dome is slated to begin in mid July. Our IWERKs 15/70 installation is expected to begin in September and we are eagerly awaiting the arrival of our new telescope at year's end.

The search for our telescope took us all over the world, from New Zealand to Mississippi, to Russia and Japan. Finally, we were able to locate a source here in the U.S. that will be able to provide us a 10 f/12 refractor. This telescope is to be manufactured by Edward Byers and will have a Byers German Equatorial mount. To our knowledge this will be the largest publicly accessible refractor in Florida.

The Museum of Arts and Sciences, Daytona Beach

Roger Hoefler, Curator of Astronomy, has graciously offered to host FLORPLAN (a get together of Florida Planetarians) sometime in October. The meeting will be held on a Saturday which meets with most everyone's schedule. Florida Planetarians should let Roger or George Fleenor know which dates are best for them!

Miami Space Transit Planetarium, Miami

Jack Horkheimer & Co. are currently presenting *Through The Eyes of Hubble* daily at 12 noon, and 3 p.m. plus 5 p.m. on Saturdays and Sundays. Another star show, *How To Find The Stars Of The Season*, is featured daily at 11 a.m., 1 p.m., and 4 p.m. In addition to two different star shows a matinee laser show

is featured daily at 2 p.m. The current featured presentation is *Laser Beatles*. Mark Bennett reports that The Beatles have drawn unusually good crowds. (Ed. note: The Bishop's Beatles show also had unusually high numbers!) The planetarium also features several large video screen theaters which feature a variety of astronomical video presentations. A live star lecture and tour of the night sky is presented every Saturday night at 7:30 p.m., followed by telescopic observation. Laser shows are presented every Friday and Saturday night at 8:30 p.m., 9:30 p.m., 10:45 p.m. and midnight. Musical talents currently featured are: Pink Floyd, the Beatles, and Led Zeppelin.

B.C.C. Planetarium, Cocoa

(Ed. note: I have not heard a repeatable word from Cocoa other than that Mark Howard has been hired as the Producer! Congratulations, Mark! Everyone should be sure to check out their web site!)

I would like to thank the staff of the Sudekum Planetarium for an outstanding conference! I would also like to thank the members of SEPA for electing me as President Elect. I consider it an honor and look forward to assisting the members of SEPA in every way I possibly can. If I can be of assistance to anyone, please feel free to call on me anytime. SEPA has many assets and I am glad to be a part of such a fine organization! Again, my sincere thanks!

Savannah Science Museum, Savannah

Erich Landstrom reports a long, hot summer at SSM: our rooftop air conditioner unit of 20 plus years is about to expire. This has led some to speculation whether it would be cheaper to replace the unit, or just move our entire institution downtown. Other pressures (attendance levels, parking, facility maintenance) also factor in, but I'd like to upgrade under the dome if we do move.

Two in-house productions, *Footsteps to Freedom* and *Alight in the Dark: Skywatching in the Age of Chivalry*, premiered over the summer. *Freedom* features historic Savannah structures to tell the story of escaping slaves following the North Star and the Underground Railroad in the pre-Civil War South. *Alight* examines monastic journal entries for atmospheric and celestial activity between 1066 AD (the appearance

of Halley's Comet) and 1134 (a total solar eclipse three days before the death of King Henry). It too has living history re-enactors for the Middle Ages, courtesy of the Society for Creative Anachronism, Inc., as well as period artwork. Both were funded in part by a grant from the City of Savannah Office of Cultural Affairs as a part of Cultural Olympiad activities.

In conjunction with the Oatland Island Education Center observatory, we will host a star party for the lunar eclipse in September. Along with assorted auguries for good weather, all together now: GO HALE BOPPI!

On a personal note, SEPA '96 was fantastic, including the unplanned walking tour of downtown Nashville. Thanks to everyone who made this first timer feel welcome, sharing freely of time and ideas (and in Jim Greenhouse's case, a

News from SEPA States
continued

George Fleenor
Bishop Planetarium
Bradenton, FL

Erich Landstrom
Savannah Science Center
Savannah, GA

Freeport McMoRan Planetarium and Observatory, Kenner

Unfortunately I am the bearer of bad news. Many of you have been reading about and following the progress of our 50 ft. planetarium project. The bad news is due to a political change in the city government (a new mayor) there was a decision to put this project on hold just two days before it went to bid. Needless to say both myself and everyone who works with me are very disappointed over this decision. I have been assured by the new mayor that the project is not dead but just on hold. Unfortunately we all know how politics works and the current mayor of Kenner is not nearly as interested in this project as the former mayor was.

On a positive note, our long awaited space station facility should be opening by the end of August. Currently the planetarium is showing More Than Meets The Eye and our Summer Sky show.

Louisiana Nature and Science Center Planetarium, New Orleans

Mark Trotter and Dennis Cowles are currently showing The Sky Tonight, Planet Patrol: A Solar System Stake Out, and Family Laser Show. They are also installing Loch Ness Productions new and improved Mars Show. The Friday and Saturday evening laser shows are Aerosmith, Rush 2112, Metallica, Pink Floyd's The Wall, Led Zeppelin, Pink Floyd's Dark Side of the Moon, and the Alternative show. The production of another rock laser show is under way to join the line up: The Best of Pink Floyd.

Mark is currently working on an in house production tentatively titled The Apollo Adventure. There are two basic foci for the show. One is to highlight the contributions of the New Orleans area to the Apollo program (Michoud Assembly Facility, National Space Technology Laboratory (now Stennis Space Center), and Slidell Computing Complex). The other focus is to discuss the criteria used in selecting each Apollo landing site and the results obtained from each of them why they were chosen, how they were chosen, and the geographical uniqueness of each site.

Dennis is working furiously to acquire a Martian meteorite. He is also developing some script ideas for the presentation on Comet Hale Bopp.

Funds are still being sought to refurbish

the planetarium.

St. Charles Parish Library Planetarium, Luling

The Luling planetarium is continuing to endure construction problems in the adjacent library. But the show must go on and Gary reports that he is doing a lot of Summer Sky shows.

Lafayette Natural History Museum Planetarium, Lafayette

After being closed abruptly in February and March, we finally reopened at the beginning of April. The Spring public program was Russians in Space, concerning, naturally, the Russian space effort. It was originally scheduled to run during March, when the planetarium was scheduled to be visited by a cosmonaut and two Russian space officials; although that was impossible due to the closure. The Russians spent a very successful two weeks in Lafayette visiting local middle and high schools and making public lectures. This visit was largely underwritten by Lafayette's Centre International.

For the summer, there are an extensive list of workshops and activities for Spaceweek and National Aviation Week, as well as an additional family astronomy series and the opening salvos of Hale Bopp observing. The summer program will be Planets, Planets, Everywhere concerning the planets and recent discoveries of planets around other stars.

After six months without a museum director, and two different interim directors in the last four months, we are now told to expect a permanent director to be selected by the end of July.

New local politicians are also expected to resolve the six year controversy over the possibility of moving the museum and planetarium into an abandoned department store. If the move is approved as expected, it is possible that we could be in operation at the new site as early as the beginning of 1998. Watch this space for flying pigs.

Settlemyre Planetarium, Rock Hill

Glen Dantzler and crew report they have finished another season of very successful camps for the Winthrop Junior Scholars Program. These intensive two week courses teach astronomy and space science to young advanced students. This year they were fortunate to feature talks by a member of the Mars Rover team and a Conceptual Engineer from NASA.

Also in the works are several new shows for the coming school year. Included in these is an adaptation of the JHE program Bear Tails which will accompany a bear exhibit in their museum. They are also gearing up for Comet Hale Bopp with an early Comet/ Perseid watch in August. The show schedule continues through the summer on Tuesdays and Fridays with Carolina Skies or an alternate children's program. Other news they're excited about is that their institution is investigating the possibility of building a new museum complex including a new 40 planetarium!

Gibbes Planetarium, Columbia

Here at Gibbes we are putting the finishing touches on a new in house production entitled Discoveries! This summer program features new information from the Galileo spacecraft, HST, and the detection of new planets. Discoveries! will run through the end of September. We also continue to run Carolina Skies which changes with the seasons to feature new constellations and sky events. In addition these public shows, we are running tour group programs during July. Groups can choose between several different selections.

Also, we are pleased to announce a new staff member. Elizabeth Orosz is our new weekend showrunner. She is also in charge of programs at the Melton Observatory located on the University of South Carolina campus and makes a fine addition here at Gibbes.

As some of you have heard, plans are still rolling to build a new planetarium here in Columbia. Although many details still need to be worked out we have high hopes for a new 50 facility replacing our current 26 dome in the near future. Stay tuned for more details.

Stanback Planetarium, Orangeburg

Jim Brown reports that this year in addition to their maintenance, they have been hosting some tour groups this summer. He regrets not being able to make it to

the SEPA conference this year, but in addition to the shows at the planetarium, he is teaching several night courses at SCSU. They plan to reopen for school programs at the end of September. Jim has also been active with his web page at <http://www.conterra.com/starman/sbp.html>. He has a nice list of planetarium and space sites. If your page isn't on his list yet, you might want to drop him a line with your web address at ZF_JBROWN@scsu.edu.

Dupont Planetarium, Aiken

Jim Mullaney also regrets not being able to attend the recent SEPA conference in Nashville. Unfortunately, being the only staff member, he was tied up with shows that week. He did manage to slip away to the earlier MAPS meeting where he gave a paper on improving the Digistar II star field by adding deep sky objects. Anyone interested might want to get in touch with him.

Jim also reports being busy throughout the summer with groups as well as public shows on the 1st and 3rd Saturday of each month. He is currently working on adapting the Buhl show: Through the Eyes of Hubble for his theater as well as several other new in house productions. On top of this schedule, he has been hosting several evening VIP groups for the University, showing off the new theater. I'm sure they have been suitably impressed.

Hooper Planetarium, Greenville

Doug Gegen reports that all is well in Greenville. Through the summer they are running a slate Friday evening public shows including The Little Star that Could and Through the Eyes of Hubble. Also they are continuing their teacher workshops, training teachers to better bring Astronomy (and other subjects) to their classes. Each teacher leaves with bundles of material that can be used directly in the classroom.

Speaking of the classroom, Doug reports that they are also hard at work readying several new school programs for the coming year. Rusty Rocket's Last Blast and Planet Patrol from the Sudekum Planetarium as well as Dinosaurs from Joe Hopkins will be featured. Many of you got to meet their show producer, Jim Flood, in Nashville whom I'm sure will be hard at work on these productions. In addition to the shows, they will host a lunar eclipse watch this September and anticipate large

Lisa F. DuFur
Craigmont Planetarium
Memphis, TN

Sudekum Planetarium, Nashville

What do you do for an encore after hosting a SEPA conference? After catching up on some much needed sleep, the staff of the Sudekum Planetarium in Nashville resumed their abnormal operations. During the summer, programs are given seven days a week. The Planetarium also supports Museum day camps. Sharon Mendonsa and Waylena McCully immediately started preparing to teach a week long camp for fifth through eighth graders using Hands On Universe and Astronomy Village software which will allow students to use the real tools of astronomers to conduct scientific investigations. Pashur House, the artist, has been producing illustrations for the Science Museum's Educator Guide and other Museum programs. Once all that is complete, he will start work on the preschool planetarium show for this next school year.

Craigmont Planetarium, Memphis

During the summer we usually get lots of daycare centers and other summer programs involving a wide range of ages. There is no one program that will be of equal interest to a first grader and a middle school student. The only one that seems to come close is Hansen Planetarium's The Secret of the Cardboard Rocket.

We'll occasionally pick one of the older students from the audience to assist in operating the console, turning the daily motion control during the numerous spaceflight sequences to simulate travel from one planet to another. You can just imagine the smug look on the face of a young person who has help operate the star projector during a show.

After the SEPA conference we reinstalled our production Hubble: From Here to Eternity. I am amazed at the response of audiences I thought might be too young to enjoy this extremely technical program. A fifth grader asked a question about the discrepancy between the age of the universe given by our assumed value of the Hubble constant and how old some stars in globular clusters appear to be. Wow! They're paying attention!

This spring the principal of the school which houses our facility handed director Duncan Teague a CD ROM announcing and promoting a new contest called ThinkQuest. Students in grades 7-12 were encouraged to collaborate by means of the Internet to create a site on the World

Wide Web. Highly valued by the contest organizers would be collaborations between students in different parts of the country, especially if their schools were dissimilar.

We contacted Geoff Holt, a former resident of the SEPA region, and asked if he had any students who would like to participate with two of our senior planetarium interns. What an excellent contact Geoff proved to be. Our students produced the script of Hubble: From Here to Eternity that served as the basic content of our entry in the ThinkQuest contest. Geoff's student, a ninth grader no less, had experience in programming in HTML, the language of the World Wide Web. Our two locations proved to be a perfect match.

While we submitted the text and the numerous images which served as the foundation of our entry, the other student created additional graphics, wrote additional text, and assembled a beautifully crafted set of pages, some 280 files total including 110 graphics. We'd like to thank SEPA President Elect George Fleenor for allowing us to include one of his original photographs of Comet Hyakutake in our contest entry. One page is a gallery of ground based photographs compared with Hubble photos of the same objects.

The ThinkQuest contest is an opportunity for our three students to win some serious scholarship money. The grand prize entry will win an unbelievable \$25,000 per student. So we would ask that our SEPA colleagues please take a look at our entry on the ThinkQuest server and make some hopefully encouraging comments about the content. Your comments might help them win, and it's also possible fellow SEPAn's might appreciate the content more than the ThinkQuest screeners and judges. The entry is called The Online Planetarium Show (TOPS) and it can be accessed on the World Wide Web at the address <http://www.advanced.org/ThinkQuest/3461>. The 3461 is our team's registration number.

Lisa DuFur recently participated in a fair to acquaint Shelby County teachers with field trip resources available in our area. A surprising number of teachers had no idea our planetarium was free to Shelby County students and that we had programs simple enough for their students to appreciate. Heck, we even have programs teachers can understand. Due to feedback from this fair, we may revive the old Jacksonville program The Weather

Peninsula Planetarium, Newport News

First, I am pleased to announce the promotion of Planetarium Producer Kenneth Moore to Assistant Director of Astronomy. Although it does mean a raise in salary for Ken, in my mind the change is just a formality. He has worked very hard to make himself indispensable, to the point that even before the promotion I often referred to him as my assistant.

After another busy year, we settled into a challenging summer schedule of 5-7 programs per day, two 3 day children's workshops, and a guided trip to the National Air and Space Center in Washington D.C. In the planetarium, we are in our second summer for a program called The Great Dinosaur Caper: A Mesozoic Murder Mystery. Attendance is still very good for this clever program from the now closed McLaughlin Planetarium in Toronto, Canada. The Comets are Coming is scheduled to open in the Fall.

This has been a wet summer for us on the eastern side of the state. It seems that our Meredith Webb Abbott Observatory has been closed more than open. On clear days we have the Celestron 14 inch telescope with a Hydrogen Alpha filter trained on the sun. On clear Thursday nights after July (due to the late sunset) the observatory is open for public views of other celestial objects.

Plans are being made for a rare second lunar eclipse party in one year. After the 400-500 person attendance at the one in April, we decided to do an encore for the eclipse on September 26. This is a week night, so we don't have any unrealistic hopes for big attendance. It's a night we're open anyway, so it was easy to extend our hours until 11 p.m. about the middle of totality.

As always, I invite other Virginia planetarians to contact me about activities in your planetariums. Send information to me by the end of September via phone 757 (note the new area code) 595 1900, by fax at 757 599 4897, or by e mail at the address pegasus321@aol.com.

Hopkins Planetarium, Roanoke

Britt Rossie reports they are showing an intriguing, new in house production called The Last Tutelo. This is a documentary on the first inhabitants of the Roanoke Valley, sponsored by the George Washington Jefferson National Forest. Later in the year, plans are in place to show The People,

Autumn Skies, and Moonwitch.

Some major upgrades are expected before the coming school year. These include a Barco video projector, a Betacam SP Player, and associated controls. This is our first major step in renovating the planetarium before hosting the SEPA conference in 1998.

Ethyl Universe Planetarium, Richmond

Just back from a spectacular IPS conference in Japan, Eric Mellenbrink reported he was still recovering from major jet lag. Aside from that, the planetarium is showing an in house production called Eye of the Hubble which runs until mid November.

The museum and grounds have been going through some changes lately. A price increase goes into effect by August 1. After that date, the planetarium will be included in the admission fee. The IMAX Dome (formally known as Omnimax??) film will remain an additional charge.

The big construction project we mentioned last time is now nearly complete. This includes a face lift on the front of the building. For those of you who have never visited Richmond, the museum is partially housed in an impressive structure which once served as a major train station. Other improvements include a new staff/visitor parking lot, an out door amphitheater, and a refurbished train track area. Work continues on the wooded trail around the museum. This is an ongoing project to install park benches and displays that demonstrate environmental themes like recycling.

Portsmouth Children's Museum Planetarium, Portsmouth

Mike Nold tells us he has entered the wonderful world of laser shows. Laser Kids is a 25 minute show designed for a 12 and under audience. The successful program includes favorites like Puff the Magic Dragon. The laser system and program comes from Joe Hopkins Engineering. Upcoming planetarium programs will be Lifestyles of the Stars, and Larry Cat in Space.

Virginia Beach City Public Schools Planetarium, Virginia Beach

Herb Teuscher reports that the planetarium is closed in July but will reopen in August. Public showings are scheduled for every Tuesday night at 7 p.m. Later in the year, there will be kindergarten

Membership Committee

Report
continued

Dave Maness
Peninsula Planetarium
Newport News, VA

in the universe and, of course, in the solar system as well. The gas giant planets and the Sun have very high percentages of hydrogen, but the other planets do not. Molecular hydrogen (H_2) has a molar mass of $m = 2 \cdot (1.008 \cdot 10^{-3} \text{ kg/mole}) = 2.016 \cdot 10^{-3} \text{ kg/mole}$, and Earth's atmosphere has an average temperature of 290 K. Plugging these values into the equation we have $v_{\text{RMS}} = 1894$ meters per second. Earth's escape velocity is 11,200 m/sec. The escape velocity is considerably higher than the RMS velocity of H_2 . So where is the hydrogen gas? There is one point that we haven't considered: the atmosphere of the Earth does not have a uniform temperature profile. The temperature varies greatly, in fact (see Appendix II). A molecule of molecular hydrogen near the surface has an RMS velocity of 1894 m/sec. One that is at an altitude of 100 km has an RMS velocity of 2333 m/sec. This RMS velocity is about one fifth of the escape velocity. There will be an appreciable number of hydrogen molecules that are moving at or above escape velocity at this temperature. It will not take long for a molecule of H_2 to migrate to the upper atmosphere where the temperatures are much higher (and thus the molecule will have an even faster velocity). At an altitude of 500 km the molecule will have an average velocity of 4010 m/sec. There will be many molecules of hydrogen gas that have the minimum velocity needed to escape. Another point to consider is the extreme reactivity of molecular hydrogen.

What about H_2 in Mars' atmosphere? The average temperature there is 240 K. Molecular hydrogen on Mars will have an RMS velocity of 1723 m/sec. The escape speed for Mars is only 5100 m/sec. Hydrogen gas will readily flee from Mars. What about H_2 on Venus? The temperature is 740 K. The RMS velocity is 3025 m/sec about one third of the escape velocity (v_{ESC} for Venus is 10.3 km/sec). Venus, say good bye to your hydrogen. The numbers for Jupiter are $v_{\text{RMS}} = 1243$ m/sec and $v_{\text{ESC}} = 60,000$ m/sec. H_2 hasn't got a prayer of getting away. Ditto for Saturn, Uranus, and Neptune. At Pluto, the numbers are $v_{\text{ESC}} = 1200$ m/sec and $v_{\text{RMS}} = 703$ m/sec. Pluto does not keep hydrogen.

Overview of the Solar System

We can use the equation for the RMS velocity of gas molecules to understand why planetary atmospheres are the way

they are and how they change over time. Take Mars as an example. It is believed that Mars once had a much thicker atmosphere than it has now; so thick in fact that liquid water could flow across the surface. But no longer much of the atmosphere leaked away because Mars didn't have enough mass to retain it. Mars is now a world with a very thin atmosphere that is made up of the gases that the low gravity of Mars allows it to keep.

Earth and Venus have undergone a similar process with respect to very light gases, like hydrogen and helium. Both planets do have sufficient mass to keep heavy gases like carbon dioxide and nitrogen. There is abundant hydrogen on both planets but it is bound up into molecules that are heavy; molecular hydrogen is too light for either planet to keep around.

The Moon and the planet Mercury have no atmospheres because they do not possess enough mass to keep them. Even if we could somehow give either one an atmosphere as thick as ours, it would gradually leak away. There are some molecules that lurk in the vicinity of both the Moon and Mercury, molecules like neon or krypton. They don't stay around for long but they do stay around. There are not enough of them, however, for us to say that either body has a sensible atmosphere (in fact, they are indistinguishable from hard vacuum).

Jupiter requires no comment. By virtue of its enormous escape velocity, some 60 km per second, Jupiter will keep almost everything. It may have lost some H_2 , but probably not much. The Galilean moon Io, however, has an atmosphere of sorts. It orbits in a cloud of sodium. Sodium has a mass of 0.023 kg per mole. The escape velocity of Io is 2560 m/sec. The RMS velocity of sodium on Io (temperature roughly 110 K) is 234 m/sec. Io will lose this sodium eventually, but it will stay in the neighborhood for some time. There may be some mechanism that replenishes the sodium that is lost (the volcanoes, perhaps?).

Saturn, Uranus, and Neptune are like Jupiter in that they will retain almost everything. These planets do not possess the tremendous escape velocity of Jupiter but they are also at a lower temperature.

Pluto presents an interesting case in that its atmosphere freezes and falls to the surface when the planet is farthest from the Sun. I know of only three gases that have been identified at Pluto: methane,

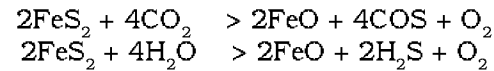
nitrogen, and carbon dioxide. We will look at methane, since it is the lightest of these three gases. Methane has a mass of 0.016 kg per mole. If we assume that Pluto has a temperature of 40 Kelvins, then methane has an RMS velocity of 250 meters per second. This is more than one fifth of the escape velocity. Over four billion years, just about all of the methane (if not all of it) should be gone. So why is it there? It may have to do with the composition of the planet. It is quite possible that Pluto has the same composition as the comets in the Kuiper Belt. In fact Pluto may be nothing more than a gigantic comet. If Pluto is a really a planet sized comet then we have an automatic process to replenish the atmosphere it comes from the planet itself. If this is true, Pluto may lose mass every time its orbit brings it closer to the Sun. Pluto heats up and part of it turns into gas and forms a temporary atmosphere. Some of this atmosphere is lost to space. As Pluto travels outward from the Sun, the atmosphere freezes and falls onto the surface.

Let us return to consider the gas giants. They are very large planets and retain practically all gases. They possess the same gases and thus are similar in composition. They probably have the same percents of chemical elements in them, but they have become differentiated over the four and one half billion years since the solar system formed. The main differences that occur between them are due to differences in temperature and the structure of the planet. This is exactly what we would expect of planetary atmospheres that formed directly from the solar nebula. In the cases of Saturn, Uranus, and Neptune, their structures have mechanisms that hide some of the gases helium in the case of Saturn and hydrogen and ammonia for Uranus and Neptune. The temperature also determines which gases are possibly chemically.

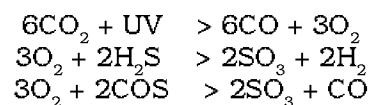
Chemical Cycles in Planetary Atmospheres

Chemical cycles in the atmospheres of planets can produce many gases, and knowing something about them can help to explain the different types of gases found on a given planet; after all, who has ever heard of a gas like carbonyl sulfide? We will look at only one example: the cycling of sulfur in the Venerian atmosphere.

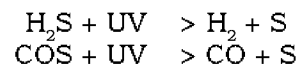
The surface of Venus is rich in iron pyrite (FeS₂). The pyrite reacts with either carbon dioxide or water vapor:



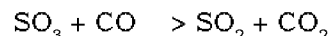
Other than the iron oxide (FeO), all of the products in these equations are gases, and all of them have been observed at Venus. The O₂ generated by these reactions is destroyed very quickly due to the high chemical reactivity of molecular oxygen. Eventually, the COS and H₂S are carried up into the upper atmosphere where they react with oxygen produced by the breakup of carbon dioxide caused by ultraviolet photons (represented here as UV):



The hydrogen sulfide and carbonyl sulfide are removed from the atmosphere by reactions between CO₂ and solar ultraviolet that produce molecular oxygen and carbon monoxide. There are two other reactions that can take place in the upper atmosphere if the UV directly reacts with the H₂S or the COS:

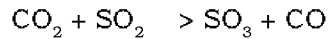


Molecular hydrogen, being very light, will escape to space if it doesn't immediately react to form something else. The sulfur is actually formed into sulfur chains (from 3-8 sulfur atoms in length) that form a dust. The SO₃ produced by the above reactions is carried throughout the atmosphere by winds and convection, eventually meeting with carbon monoxide:

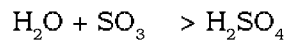


The reverse of this reaction also occurs:

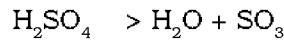
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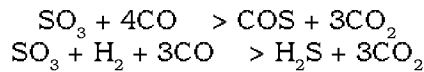
The sulfur trioxide can react with water vapor in the upper atmosphere to form sulfuric acid:



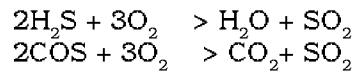
Sulfuric acid forms droplets in the atmosphere of Venus. These droplets fall toward the surface, analogous to rain on the Earth. The temperature and pressure rises closer to the surface which favors the break down of the acid:



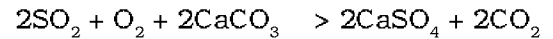
The SO_3 reacts with CO :



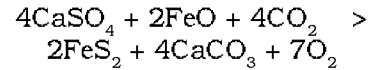
The product gases can react to form SO_2 :



The SO_2 reacts with calcium carbonate in the surface rocks:



Calcium carbonate is one of the key chemicals that controls the pressure of the carbon dioxide in the Venerian atmosphere. One more reaction occurs:



We have regenerated the iron pyrite and thus completed the cycle.

For every chemical appearing in a planetary atmosphere, some sort of cycle like this occurs. It is a major goal of atmospheric scientists to unravel the chemistry of such cycles. These cycles are interesting. They show us interrelations between the planet's surface, its atmosphere, and the Sun.

(Dennis Cowles is one of Southern Skies most prolific writers. Part Two of this article will appear in the Fall 1996 issue of this journal.)

Spacecraft Encyclopedia

Nicole Hassold
Junior Intern
Craigmont Planetarium
Memphis, TN



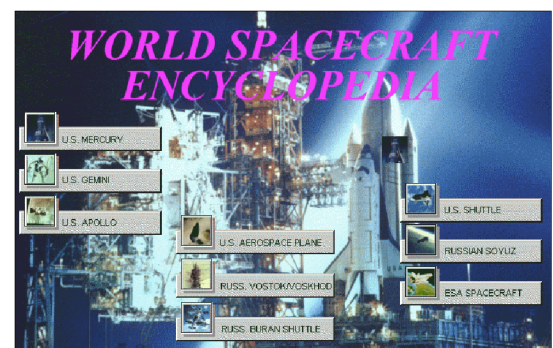
Interested in all types of spacecraft, whether it be from the U.S. or Russia? Spacecraft Encyclopedia is for you. It is a CD ROM from American MPC Research. Its claims to be a complete encyclopedia of every spacecraft in the world.

The viewer can select from several key areas. Each includes written information about the specific spacecraft and contains a slide show that lets you to see the spacecraft in motion. The CD ROM has vivid imagery and live action shots. It traces virtually every spacecraft that was produced by the United States, Russia, and the European Space Agency. It begins with Russian Vostok and American Mercury capsules and follows the space programs to futuristic hypersonic planes.

When I first began looking at the disc, I thought that I was in for a long, dry lecture. Boy, was I wrong! It makes space travel interesting even to a person who has little interest in space programs. I would recommend it to anyone who has even the

slightest interest in space travel. I can't say enough to express the excitement I felt watching the space shuttle lift off. Not only can I view the take off, but I can also get specifics on what it takes to get that shuttle off the ground.

I would recommend this CD ROM to anyone interested in the space program. It is available for \$12.95 from American MPC Research, Inc. Call 310 801 0108. It's worth the money!



World Spacecraft Encyclopedia main menu

Southern Skies

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SUMMER 1996

In This Issue

President's Message.....	1
Let's Go Surfin' Now.....	3
IPS Report.....	3
Featured Planetarium: Alexander Brest Planetarium, Jacksonville, FL.....	4
Small Talk.....	5
Global Mythology, Part 3: Summer Constellations.....	6
Astro-Video Review.....	11
Cruise to the PPA Fall Meeting.....	11
Book Review: Making and Enjoying Telescopes: Six Complete Projects and a Stargazer's Guide.....	12
Evolution of Planetary Atmospheres.....	14
News from SEPA States.....	16
Spacecraft Encyclopedia CD-ROM.....	24

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