down to 32 km (19 miles) in diameter. Undoubtedly there are much smaller particles in the belt. It turns out —based on our estimates of size, and the relatively small number of asteroids — that if you glued all the asteroids together and made them into a planet —you'd get a world a bit smaller than Pluto! It seems that the asteroids were never a planet — but more likely a collection of rocky worldlets that never got it together to make a planet!

While most of the asteroids are so far away that we cannot see them very well, some few asteroids actually cross the path of the Earth's orbit. About 1300 of these have been identified so far, and they are grouped into three families: the Atens, Apollos and Amors. Icarus is one of these asteroids, and passed within 6.4 million kilometers (around 4 million miles) of Earth, in 1967.

It is theoretically possible that an asteroid could hit the Earth. Indeed, some current theories of dinosaur extinction hinge on the actual collision of an asteroid with the earth some 65 million years ago. This collision could have kicked up a tremendous amount of dust into the atmosphere, obscuring the Sun and causing a general cooling trend in the weather. This cooling trend, if sudden, would have killed off the plant life on which the dinosaurs lived, thereby killing the dinosaurs. So goes the theory.

At the heart of the theory is the element iridium — which is known to be abundant in meteorites of asteroid-belt origin. Iridium is not too abundant on Earth — but core samples of the Earth's rock layers show an iridium-rich layer dated back about 65 million years. Chances of another asteroid hitting the Earth are fairly slim — some scientists put it at 3.5 per every million years.

Aside from iridium, most asteroids fall into three categories: C, or carbonaceous S, or silicaceous M, or metallic. The first types are carbonacious chondrites — stony, carbon-based bodies. The Silicaceous types are mostly silicon, with other metals in smaller amounts. These are redder and brighter than the others. The metallic asteroids are mostly iron and nickle, more massive than the others. All three types are of interest to scientists studying the origin and evolution of the solar system.

But, rocky asteroids are not the sole inhabitants of the Belt. There are, scientists feel, a great many former comets in orbit out there. These icy nuclei were probably perturbed from their paths to the Sun by the gravitational pull of Jupiter.

No doubt all of these different asteroids will be of interest to future geologists. Not far behind them will probably be the miners — who, if science fiction accounts hold up — will mine the ore to build spaceships, space stations and all of the other tools that we will need someday to further our own adventures in the outer solar system. For now, though, the asteroids remain somewhat enigmatic — another place to explore in the planetary neighborhood.

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Next Meeting November 26, 1991

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THE Prairie Astronomer

President's Message

by Dave Knisely

At the last meeting, it was decided to move the date of the December meeting to Thursday, December 26th at 7:30 p.m., so mark that date on your calendars. It will also be a good time to give guidance to young people who have just received a telescope for Christmas, so be sure and come.

I want to thank Ron "STARMAN" Debus for taking the time to setup and take orders for the cub shirts and other items at the last club meeting. If you were unable to attend, you may still purchase those items, but you must deal with the store directly, rather than through the club.

The recent snow storm canceled the November 1st star party, but on the 8th, we were treated to a fine Aurora courtesy of a major solar flare which erupted a few days earlier. We have a number of members interested in using the site on nights other than those of scheduled star parties. If you are one of these people, you may want to invest in a site rental key. They are still available for $15 per year from Lee Thomas. The money from key rental pays our site taxes and insurance, and thus keeps us from having to dip into the treasury to support the site. Site construction plans have been put on hold until spring due to the weather, but we are still looking at an astrophotography enclosure to be built north of the main silo pad.

The 1993 Convention committee now has the following individuals:

Bev Hetzel and Ron Veys
(Co-Chairperson's)

Erik Hubl	Russ Copple	Tom Miller	Michaela Brown	Earl Moser
Rick Johnson	Lee Thomas	Morton Stelling	Dave Knisely	Russ Genzmer
Rick Littrell	Dennis Dunn	Jack Dunn	Pam Killion	

This is better than I had hoped for. If you are interested in helping, you may sign up at any time. The first committee meeting will be sometime in January. See you at the meeting.

A Planetary Grand Tour

by Carolyn Collins Petersen

The Asteroids

Ever meet Hazel Stone? She's a feisty lady, who's seen it all — and some believe — done it all. Her stories of The Galactic Overlord thrill millions of viewers, she's a top-flight space pilot, and she can beat the pants off anybody (except her grandson, Lowell) at chess. Nobody would believe that she once took part in the uprising to liberate Luna — and, nobody would believe that she once almost died amongst the asteroids because she forgot to check her oxy bottles.

If you haven't met Hazel yet, she's one of the central figures in Robert A. Heinlein's "The Rolling Stones" — a science fiction book about a family that roams the solar system in search of adventure.

Part of Hazel's story does indeed take place amongst the asteroids — a collection of 100,000 or so rock fragments sometimes referred to as 'the minor planets'. This belt of tiny worldlets lies mostly between the orbits of Mars and Jupiter, with a few maverick asteroid groups making their way out as far as Saturn, and inward toward the orbit of Earth.

The asteroids have been the subject of many a science fiction story. Many tales postulate huge mining companies sweeping through the belt, turning the ore-ridden rocks into metal for spaceships. Others — such as Heinlein's —turn the Asteroid Belt into a future frontier mining camp, with feisty, grizzled old prospectors staking their claims on rotating odd lumps of rock. Lately, in a kind of "truth is stranger than fiction" turnabout, asteroids have been linked with dinosaurs and collisions with Earth.

Mining seems to be a popular pastime in the asteroids of the future — and while it may seem rather farfetched to even consider the idea, asteroid mining COULD be done. Not right now, to be sure, but in some future decade, scientists and miners could descend on a hapless asteroid for a spate of assaying.

What is the fascination with these asteroids? What is it about them that makes them such a target for mining? And, why the link with dinosaurs?

We have no first-hand experience in the asteroid belt, so most of the information available on the area has come from observations made here on Earth.

It used to be a common belief that the asteroids were once a planet, a world which exploded sometime in the misty past of the solar system. Indeed, the asteroids do orbit an area of the solar system where a planet WAS predicted to exist by Bode's Law. (Bode's Law is a mathematical way to predict the positions of the planets in the solar system.) In fact, the search for a planet between the orbits of Mars and Jupiter led indirectly to the discovery of the asteroids.

The asteroid Ceres was discovered in 1801, and its orbit was confirmed later that year. Within the next six years, Pallas, Juno and Vesta were discovered — all by astronomers watching carefully for small specks of light that seemed to move through the sky from night to night. The discoverer of Ceres, Giuseppi Piazzi, had been asked to search for the missing planet — but intead, was actually looking for comets!

(The honor of naming the asteroids generally have fallen to their discoverers. Unfortunately, as more were discovered, astronomers ran out of operatic heroines, flowers, wives and scientists after whom they could name their finds. There are now over 3000 asteroids named, some with such monickers as Gaussia, Washingtonia, and Rockefellia!)

Asteroids are grouped by the characteristics of their orbits. These "families" of asteroids generally move at about the same orbital speed and inclination. Observers have identified about 100 families of asteroids.

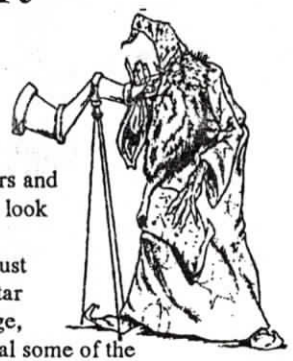
Ground-based observations of asteroids have given us some idea of their sizes and orbital characteristics. Most of them that we have been able to measure range in size from 1025 km (635 miles)

Continued on Last Page...

The Prairie Astronomer is published monthly by the Prairie Astronomy Club, Inc., and is free to all club members. Membership status and expiration date are listed on the mailing label. Membership dues are: Junior Members and Newsletter Only Subscribers...$10/yr; Regular Members...$26/yr; Family Memberships...$29/yr; Address all new memberships, renewals, or questions to THE PRAIRIE ASTRONOMY CLUB, INC., P.O BOX 80553, LINCOLN, NE 68501. For other club information contact one of the following officers: Dave Knisely (Pres)223-3968, Eric Hubl (V.Pres)423-6267, Ron Veys (Sec)486-1449, Lee Thomas(Tres)483-5639, Jack Dunn (2nd V. Pres)475-3013. All newsletter comments and articles should be sent to Newsletter Editor JOHN LORTZ, 12023 PARKER PLZ #105, OMAHA, NE 68154 no later than 10 days before monthly club meetings. Club meetings are held the last Tuesday of each month at Hyde Observatory in Lincoln, NE.

Observing Chairman's Report

by Dave Knisely



THE NEXT SCHEDULED STAR PARTIES ARE FRIDAY, NOVEMBER 29TH, AND DECEMBER 6TH AT THE ATLAS SITE. The early winter sky offers a few remaining galaxies plus a large number of interesting clusters and nebulae. Those with moderate aperture scopes will want to look about three degrees east of the pretty double star Gamma Andromeda for the edge-on spiral galaxy, NGC 891. It is just visible in a four inch as a dim fuzzy streak in a fairly rich star field. A six or eight inch will show a bit of the nuclear bulge, while a ten inch at moderate to high magnification will reveal some of the prominent irregular dark lane which runs the length of the galaxy.

Another interesting but challenging galaxy is NGC 908, located 5.7 degrees east of the star 59 Ceti. Although visible in a four inch, this object shows little detail unless moderate to large apertures are used. On a good night, an eight or ten inch will sometimes reveal some mottling across the face of this moderate sized galaxy.

In Aries is the interesting spiral NGC 772, located 1.3 degrees east and 1/4 degree south of Gamma Aretis. An eight inch will show it as a moderate sized faint slightly elongated fuzzy patch with a brighter small elliptical core. The edges appear very irregular and a ten inch will show a notable flaring of the outer haze towards the north-west, plus a vague dark arc just south of the nucleus. Large telescope users should also look for the small companion galaxy, NGC 770, which lies just to the south.

Way down south in Fornax is the barred spiral galaxy, NGC 1097, located about 2.2 degrees north and 1/4 west of Beta Fornacis. Visible in a four inch as a small faint fuzzy oval patch with a brighter center, this object does show some detail in large apertures. A ten inch will show the brighter center with an oval section running roughly north to south and hints of a bar running off from the nucleus. Faint arcs of light are also visible off the north and south ends, with the northern arm running off toward the north-east. A small faint star-like patch, NGC 1097A, lies north-west of the northern arm.

In Eridanus is the planetary nebula, NGC 1535, which lies about 2.5 degrees south of 39 Eridani. Small telescopes will show it as a fuzzy 9th magnitude star-like object, while six or eight inch apertures will reveal it as a small bright fuzzy bluish disk with hazy edges. A ten inch at high power often shows a hazy outer shell in contact with a brilliant inner disk that has some vague detail. When seeing is good, the faint central star is also visible.

Another interesting planetary nebula can be found in Camelopardalis, namely, NGC 1501. Located seven degrees west and a half north of Beta, this object is though to see at all in small telescopes without nebular filters. An eight inch reveals it as a moderate sized fuzzy bluish-gray disk with a slightly darker center. A ten inch and the UHC or OIII filters makes the outer edge seem sharper and brighter.

After a quick look at the Pleaides, you may want to try a more distant open cluster like M36, located 5.3 degrees west and three south of Theta Aurigae. Visible in binoculars, this cluster will show 50 to 60 stars in apertures six inches and larger. Also in Auriga is M37, a rich and spectacular open cluster located five degrees south and 1.5 degrees west of Theta. It resolves well even in fairly small instruments and is even visible in binoculars.

HOW TO SAVE INFORMATION ON YOUR COMPUTER

There are two methods for saving NASA Spacelink information. Virtually any communications software will allow you to capture NASA Spacelink documents as they are displayed on your screen. You may save the information on disk or send it to your printer. The other method is to use XMODEM, a public domain file transfer protocol.

XMODEM allows information to be transferred from one computer to another with an enhanced degree of accuracy. To take advantage of this feature, your communications software must support XMODEM. Computer programs and graphics may be downloaded from NASA Spacelink **only** by using the XMODEM checksum protocol, so for these documents you'll not be given the view option.

To perform an XMODEM transfer, first go to the desired NASA Spacelink document. When you are asked to choose between View and XMODEM, enter X. NASA Spacelink will tell you the size of the file in 128-byte blocks, and wait for you to activate the XMODEM option in your software. Then, your computer will signal NASA Spacelink to begin the transfer, and you will be notified as each block is received. When the transfer is complete, a NASA Spacelink menu will reappear.

NASA SPACELINK CONTROL KEYS

Key	Response
C	Continuous Scrolling
S	Stop Viewing Document
Control/S	Pause
Control/Q	Cancel Control/S
Control/X	Cancel XMODEM

NOTE: At lower baud rates, NASA Spacelink will respond slowly to "S" and "Control/S."

HOW TO TALK TO NASA

NASA Spacelink isn't just a machine. It's maintained by NASA people who would like to hear from you if you have questions, comments, or suggestions. If you are an educator, you may use the system to communicate directly with NASA education specialists who can provide further assistance.

When you log off NASA Spacelink using Option 1 from the Main Menu, you will be asked if you wish to leave a message for NASA. You may enter as many as 15 lines to be read by the NASA Spacelink System Administrator. To end your message, enter a blank line. The System Administrator reads messages each weekday morning and will respond to you through regular mail or with a note which will appear the next time you log on.

The following organizations provide information for NASA Spacelink:

NASA Headquarters
Washington, D. C.

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Mountain View, California

Goddard Space Flight Center
Greenbelt, Maryland

Jet Propulsion Laboratory
Pasadena, California

Johnson Space Flight Center
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Kennedy Space Center
Florida

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Data Format 8-NONE-1

NASA SpaceLink

An Electronic Information System For Educators

Current NASA News
Aeronautics
Space Exploration
NASA and its Centers
NASA Educational Services
Classroom Materials
Space Program Spinoffs

WHAT IS NASA SPACELINK?

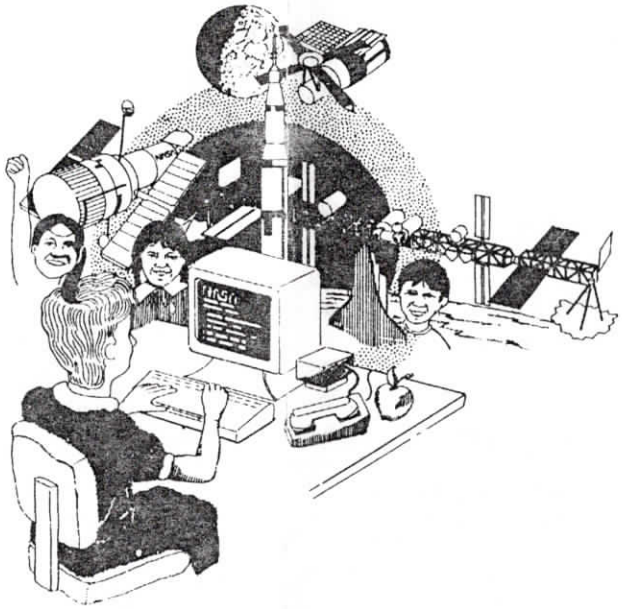
NASA Spacelink is a collection of NASA information and educational materials stored on a computer at the Marshall Space Flight Center in Huntsville, Alabama. The system may be accessed over regular telephone lines. It is designed to communicate with a wide variety of computers and modems, especially those most commonly found in classrooms and homes. NASA Spacelink is free, but you'll owe your telephone company for long distance calls.

NASA Spacelink is provided by the NASA Educational Affairs Division and is operated by the Public Services and Education Branch of the Marshall Center Public Affairs Office. System software was developed and donated to NASA by the Data General Corporation. The system has a main memory of 14 megabytes (14 million characters), disk storage space for 708 megabytes, and can communicate with eight callers simultaneously at 300, 1200, or 2400 baud.

WHAT'S IN THE SYSTEM

NASA Spacelink Main Menu:

1. **Log Off NASA Spacelink:** Use when leaving the system. Contains procedure for entering a message to NASA.
2. **NASA Spacelink Overview:** A review of the introduction to NASA Spacelink, an explanation of XMODEM, and a procedure for revising the address information provided at initial logon.
3. **Current NASA News:** Dated information subject to daily change. Topics include listings of NASA educational workshops for teachers, news releases, shuttle status reports, copies of recent speeches by NASA managers, TV schedules, the shuttle manifest, and current shuttle flight activities.
4. **Aeronautics:** Information on current and past NASA research in aeronautics, including documents on the National Aerospace Plane, aircraft propulsion, wind tunnels, and aircraft design.
5. **Space Exploration: Before the Shuttle:** Historical information on the U.S. Space Program, including documents on the Mercury, Gemini, Apollo and Skylab programs, as well as information on planetary probes, satellites, and other unmanned missions of the 50s, 60s, and 70s.



6. **Space Exploration: The Shuttle and Beyond:** Comprehensive material on the Space Shuttle and shuttle payloads, as well as current information on topics such as Space Station Freedom, astronauts, planetary probes, space observatories, and satellites. Generally, this area contains material on aerospace research in the 80s and beyond.
7. **NASA and its Centers:** Overviews of the responsibilities and resources of all NASA Research Centers and other installations.
8. **NASA Educational Services:** A listing of all the major NASA educational programs. Subjects include the Aerospace Education Services Project, Urban Community Enrichment Program, Summer High School Apprenticeship Research Program, Space Science Student Involvement Project, Teacher Workshops, Educators Mailing List, Telelectures, Teacher Resource Centers, and Science Fair support.
9. **Classroom Materials:** A variety of information useful in the classroom, including space science lesson plans and activities (all grade levels and many subjects), astronomy information, film/video lists, computer programs, career information, computer graphics, and a source list for pictures, posters, and other educational materials.
10. **Space Program Spinoffs:** Reports on the many ways in which Space Program research has been adapted to benefit industry and the public.

HOW TO SIGN ON

Use the instructions that came with your modem and communications software when calling NASA Spacelink. The computer access number is 205-895-0028 and the data format is 8 data bits, no parity, and 1 stop bit. Your computer may send carriage returns or line feeds, but not both.

When your computer connects with NASA Spacelink, a welcome screen will appear with instructions for logging on to the system. When you press Return, NASA Spacelink will ask first for a Username, and then a Password. To log on as a first-time caller, you must enter the Username NEWUSER and the Password NEWUSER, after which you will be asked to enter the number of lines your computer will display at one time (usually 24). NASA Spacelink will pause each time this number of lines is displayed, to allow time for reading. To continue after a pause, press Return. Any time you type a response to the system, enter the response by pressing Return.

As a first-time caller, you will receive an introduction to NASA Spacelink and you will be asked to provide some background information, including your name and address. NASA will need this information should you request material to be sent by mail. The information will also be helpful in planning future development of NASA Spacelink.

Most important, you will be asked to assign yourself a personal Username and Password to be used for future calls.

HOW TO FIND INFORMATION

After the introduction, the NASA Spacelink Main Menu will be displayed. Type the number of a menu item, and press your computer's Return key. You will find one or more submenus under each item in the main menu.

Choose menu items until you reach the desired document. For example, if you want to plan a 6th grade lesson around food for astronauts, choose item 9 from the Main Menu (Materials for Classroom Use). From the next menu choose item 2 (Living in Space Activities, Grades 1-6). From the next menu choose item 2 (Food Lesson Plans). Your final menu choice will be item 6 (Grades 4-6), a document containing suggested activities for sixth grade students. Before NASA Spacelink sends most documents, you'll be asked to choose a method for receiving them (View or XMODEM) To view a document on your computer, just press the Return key.