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THE PRAIRIE ASTRONOMER

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HOTTEST SPOT IN THE SOLAR SYSTEM IS DISCOVERED NEAR JUPITER

Space scientists have announced the discovery of the hottest spot yet measured in the solar system, a sort of interplanetary torrid zone near Jupiter with temperatures more than 100 times those of the sun's surface.

The measurements of temperatures of between 300 million and 400 million degrees Celsius were made three months ago by instruments aboard the Voyager 1 spacecraft as it passed near Jupiter.

Such enormous temperature levels were found in a layer of charged particles, or ions, that are believed to be hydrogen, sulphur and oxygen stemming from Jupiter's satellite Io, perhaps from the volcanoes that have been found on the moon by Voyager 1.

"The temperatures of the area are certainly the highest yet measured anywhere in the solar system and are perhaps the highest that will ever be measured in the solar system", said Dr. S. M. Krimigis, the principal investigator of the experiment.

Krimigis is head of the space physics and instrumentation group of the Johns Hopkins University Applied Physics Laboratory in Laurel, Md. His principal colleagues on the experiment were Dr. George Gloeckler, professor of physics at the University of Maryland, and Dr. T.P. Armstrong,

professor of physics at the University of Kansas.

The envelope of extremely hot charged particles was encountered by Voyager about 3 million miles from the Jovian surface at the point where Jupiter's magnetic field is just strong enough to maintain the particles in one place relative to the planet. This boundary line is known as the magnetopause.

"The spacecraft was not vaporized by the extreme heat because the density of the plasma is extremely low --a greater vacuum than any that exists on Earth--so that there is a very low transfer of heat between the plasma and the spacecraft," Krimigis said.

JUNE PAC MEETING NOTICE...

The monthly meeting of the Prairie Astronomy Club will be held at Hyde Observatory on Tuesday, June 26, at 7:30 p.m.

As usual, the Hyde Observatory Steering Committee will hold its regular meeting one hour earlier, at 6:30 p.m.

PAC Program Chairman Rick Johnson is on vacation, so we are unable to announce the program topics at press time.

THE PRESIDENT'S REPORT:

After last month's long but interesting meeting (four program presentations!), this has been a fairly quiet month. The only thing to report on is the status of the club telescope project. (For those who don't know it, the club owns a 12½-inch Newtonian which is kept in a fold-down shed on Earl Moser's farm in Hickman. The telescope can be used by any interested club member.)

Walt and his group have inspected the scope and he reports that it needs a little work--including re-silvering of the mirror, and possibly refiguring as well. We'll have a full report and vote on funds at the June meeting.

By the way, we have not yet received replies from every member on the survey form that was in the last newsletter. We want your input, so please fill it out and return it if you haven't done so.

I'd like to use the next few inches of space to say thanks to a very hard-working club member--Lee Thomas. I feel that a member who gives so much of his time and energy to our club with no thought of reward at least deserves mention and a word of thanks. As Treasurer, Lee spends a lot of time each year collecting dues, renewing subscriptions, updating the membership roster, and just keeping the club's bookwork in order. He also writes, publishes, and mails our newsletter each month, and produces a lot of publicity handouts on our club activities. Because of his efforts, the observatory has received more publicity (via press releases and free radio announcements) than it could ever have expected without his help.

In addition, Lee was responsible for selecting and installing the new sound system at the observatory plus he has written many of the slide-tape shows and recorded and produced almost all of them that the observatory uses. Without his expertise, these presentations would not be nearly as professional as they are. Along with all of this, Lee is a member of the observatory's Board of Supervisors and has had a hand in the construction and operation

(Continued on Page 7)

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THE BARLOW LENS, PART 3...BY LARRY STEPP

This is the third installment of the series on Barlow lenses. In the first part I discussed thin lens formulas relating focal length, spacing and magnification. In the second part I described two simple accessories an amateur can build to increase the magnification of a Barlow lens, and to adapt a regular Barlow to two inch diameter eyepieces. To illustrate the use of a Barlow to expand the fully illuminated field of a telescope, let's work an example.

Assume we have a Barlow lens with a clear aperture of 26mm and a focal length of -100mm, used in a 6-inch f/8 telescope. If the Barlow is in a tube designed to give a 2X magnification factor, we can calculate the fully illuminated field, assuming no obstruction from the diagonal. From the formulas given earlier,

$$a = (f / m) - f$$

so $a = 50\text{mm}$ (remember f is negative). Then:

$$e = (dF - Da) / (F - a)$$

so $e = (26 \times 48 \times 25.4 - 6 \times 25.4 \times 50) / (48 \times 25.4 - 50)$ or e is approximately 20mm. Since $c = 2e$, the fully illuminated field at 2X is 40mm in diameter. What happens if an extension tube is used to increase the magnification to 3X? Then $a = 67\text{mm}$, $e = 18.6\text{mm}$, and $c = 56\text{mm}$! This shows that, except for some possible vignetting in the tube of the Barlow it-

self, if an extension tube is used to increase the power, the fully illuminated field will be plenty for any two-inch eyepiece.

One topic we have not discussed yet is the effect of a Barlow lens on the exit pupil of the telescope. As you know, the exit pupil is the place in the light path, just above the eyelens of the eyepiece, where the parallel light rays leaving different parts of the eyelens form the tightest concentration. The observer's eye can most easily catch all the light from the eyepiece if it is located at the exit pupil.

When a Barlow lens is used with a telescope, both the diameter and the position of the exit pupil are changed. The diameter of the exit pupil is equal to the diameter of the objective divided by the magnification, so it is obvious that the Barlow, in increasing the magnification, decreases the exit pupil diameter in the same proportion. The effect on the position requires a little more explaining. The exit pupil is actually the image of the objective formed by the eyepiece. Since the objective is relatively far away compared to the focal length of the eyepiece, the exit pupil is formed approximately one focal length away from the eyepiece.

Let's work an example to explain this more fully. If a 6-inch f/8 reflector is used with a 20mm focal

(Continued on Page 4)

FIGURE 5

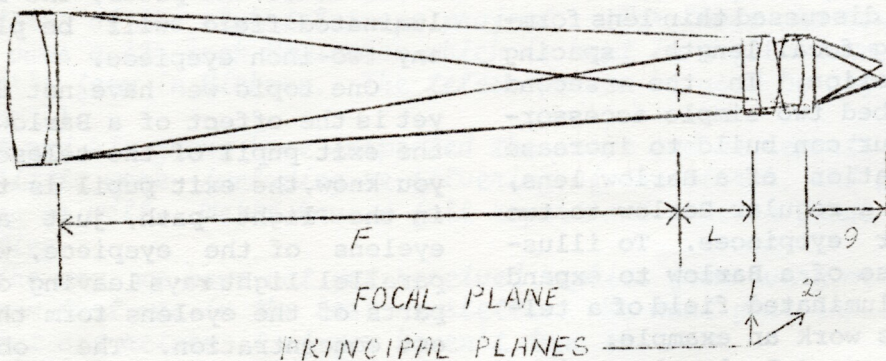
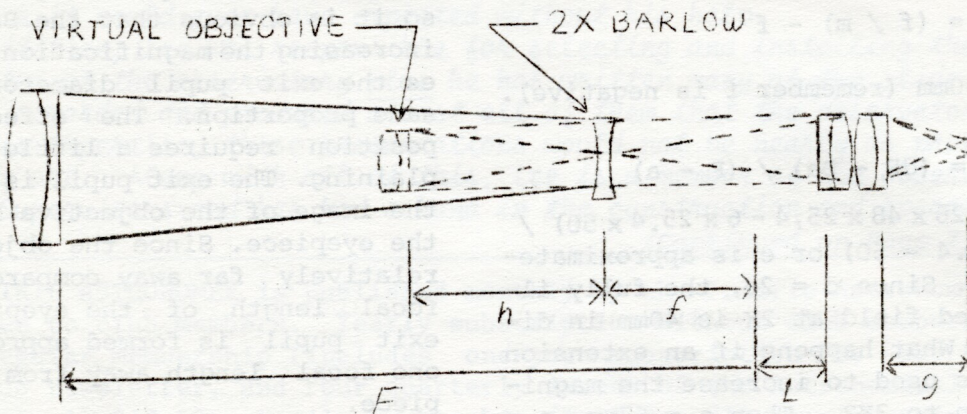


FIGURE 6



Let's work an example to explain this more fully. Let's use a 30mm focal length objective lens and a 2x Barlow lens. The focal length of the Barlow lens is 15mm. The distance from the objective to the Barlow lens is 15mm. The distance from the Barlow lens to the eyepiece is 15mm. The focal length of the objective is 30mm. The distance from the objective to the eyepiece is 45mm. The focal plane is 45mm from the objective. The principal planes are 15mm from the objective and 15mm from the eyepiece.

THE BARLOW LENS, PART 3

(continued from Page 3)

length symmetrical eyepiece we can calculate the position of the exit pupil by using standard thin lens formulas (see figure 5). The focal length of the objective is F , that of the eyepiece is L , and the distance from the second principal plane of the eyepiece to the exit pupil is g (principal planes are just the theoretical planes in the light path from which you measure in order to be able to use thin lens formulas for groups of lenses like an eyepiece. We can find the distance g by the formula:

$$\frac{1}{g} = \frac{1}{L} - \frac{1}{F + L}$$

For our example $g = 1 / (1 / 20 - 1 / ((48 \times 25.4) + 20))$, or $g = 20.3\text{mm}$. The actual distance from the eyelens to the exit pupil is less than this, for a symmetrical eyepiece it would be about 80% of this or about 16mm.

When a Barlow lens is inserted in this system (see figure 6) the eyepiece "sees" the objective as smaller and closer, as a virtual image in the Barlow lens. The position of the virtual image can be found by the same formula used above, using the focal length of the objective F , the distance to the virtual image h , and the focal length of the Barlow lens as f . Let $f = -100\text{mm}$.

$$\frac{1}{h} = \frac{1}{f} - \frac{1}{F}$$

So, $h = 1 / (1 / (-100) - 1 / (46 \times 25.4))$ or, $h = -92.1\text{mm}$ (that is, 92.1mm to the left of the Barlow lens.) Using this virtual position for the objective we can find the distance $g = 1 / (1 / 20 - 1 / (92.1 + 120))$, or $g = 22.1\text{mm}$. This means the exit pupil will be located about 1.8mm farther out from the eyelens, better, but only by 1/16 of an inch. The important comparison, however, is that to have achieved the same overall magnification with an eyepiece alone, the exit pupil would have been half as far from the eyelens of the (10mm) eyepiece required.

In the next part of this series I will describe a telescope modification which takes advantage of this effect to provide improved eye relief with ordinary eyepieces.

LIFE ON MARS SAID STILL POSSIBLE

Four University of Massachusetts astronomers say that they have found evidence on Mars of two large sub-surface accumulations of water, one of which may be "hospitable" to life.

One oasis is 400 miles across and the other 720 miles in diameter, the scientists reported to the Planetary Geology Principal Investigators meeting at Brown University.

Data from an Earth-based telescope and water-detection devices aboard the two orbiting Viking spacecraft have shown water evaporating from two sites, said Robert L. Hug-

(Continued on Page 8)

TWO NEW PROGRAMS ARE OFFERED BY ASTRONOMICAL LEAGUE

Two new educational programs have been announced by the Astronomical League, the national federation of astronomy societies and individuals, of which the PAC is a member club.

The Herschel Club, conducted by the Ancient City Astronomy Club in St. Augustine, Florida, has been developed as an advanced sequel to the popular Messier Club deep sky observing program. Observers who have observed 400 selected objects originally catalogued by William Herschel in the 18th and 19th Centuries will be eligible for specially-designed League certificates acknowledging their work.

A committee of the Florida group, led by Brenda Guzman, coordinator, has been working on the project for two years. Detailed descriptions and photographs of each of the 400 objects will be published in an observing guide similar to the League's present OBSERVE THE MESSIER OBJECTS. Records of estimated magnitude, sky conditions, type of instrument used, time and description of the particular object are verified by a local society officer or forwarded directly to Guzman for verification. Any amateur astronomer may participate. For more information, write:

495 Arricola Avenue
St. Augustine,
Florida 32084

The Willingboro Astronomical So-

ciety Astronomy Program is an individualized education effort which can be conducted by a society as a group activity or by an individual amateur. A series of activities or observing and educational goals are listed in areas such as: deep sky objects, multiple star systems, astrophotography, variable stars, scientific concepts and theory, solar system observing. Instructions and checklists are provided in a booklet published by the Willingboro Astronomical Society of New Jersey and the League's Middle East Region. The Willingboro group, originators of the program, are conducting it for the League.

Persons who have completed steps of the program qualify for education certificates for each step. Send \$2 for each copy to the coordinator:

Phillip A. Webber
58 Ember Lane
Willingboro,
New Jersey 08045

DID AN EXPLODING STAR KILL EARTH'S DINOSAURS AND PAVE THE WAY FOR MAN?

A lethal bombardment of cosmic radiation from an exploding star may have blanketed the Earth 65 million years ago, wiping out the dinosaurs and paving the way for man's evolution, University of California researchers say.

(Continued on Page 7)

PRESIDENT'S REPORT (Continued from Page 2)

of the observatory from the very beginning.

As you know, Lee is Station Manager of KLMS Radio, and his duties there occupy an extremely large part of his days. However, no matter how busy he is, Lee always seems to find time to work for our club. Most of his work is behind the scenes, it's true, but, at the risk of embarrassing him, I would have to say that Lee Thomas is our club's least recognized but most deserving member. We owe him an extremely large debt of thanks.

-- Ron Veys

EXPLODING STAR KILLS DINOSAURS?
(Continued from Page 6)

The new theory, based upon radiological testing of the rare element iridium, is another attempt at explaining the relatively rapid disappearance of the huge reptiles who at one time ruled their steamy environment, the researchers say.

University geologist Walter Alvarez, who presented a report on the group's findings to the American Geophysical Union conference in Washington, D.C., called it "the most dramatic event involving the most dramatic animals ever seen."

"And it had tremendous implications," he said. "It gave the early mammals scope for evolution. Had the dinosaurs not become extinct, we might not be here."

Alvarez disclosed the group's findings in interviews in Berkeley, California, prior to the conference.

The new theory is based upon the presence of iridium in limestone samples gathered at a site in Gubbio, Italy, where millions of years of

geologic history lie exposed in sedimentary layers above a 1,000-foot-high road cut, the researchers say.

The researchers brought samples from the site to a small nuclear test reactor at the Lawrence Berkeley Laboratory operated by the university. Bombarding the 1-inch-thick samples with radiation, they observed the characteristic release of particles showing presence of iridium.

The white metal is known to occur in extremely small quantities on Earth. But it is believed to be about 3,000 times more abundant in the rest of the solar system.

At exactly the same time the dinosaurs are believed to have become extinct, the traces of iridium in one sample jumped 20 to 25 times higher than normal, then declined gradually.

If the limestone measurements are correct, Alvarez says, the added iridium must have come from a source outside Earth.

(--Associated Press)

LIGHT CONTEST DEADLINE EXTENDED

The deadline for entries in the Astronomical League contest for photographs about Light Pollution has been extended to August 1, according to Tom Campbell, Temple Terrace, FL coordinator for the contest.

Campbell explains that the League has extended the deadline in order to increase the number of entries available for the contest, which is designed to create public awareness of the problem facing amateur and professional astronomers. The photographs will then be used by the League, Campbell said, to help publicize the problem and raise public awareness.

Eligible to enter are any non-professional photographers. It is not necessary to be a League member, Campbell explains. Black and white or color prints and slides are eligible which demonstrate the problem or call attention to an adequate solution. Technical information and artistic merit will be considered by the judges.

For more information, write:

Tom Campbell

5405 98th Avenue

Temple Terrace, FL 33617

LIFE ON MARS (From page 5)

enin, professor of physics and astronomy. One site, Solis Lacus, "appears to be more hospitable" than some cold areas of earth to organisms.

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