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THE PRAIRIE ASTRONOMER

Volume 19, Number 8

July 31, 1979

NEW THEORY OF A "QUIET SUN" THAT IS ACTUALLY SHRINKING

The sun may be in a period of decline.

A number of physicists believe that its nuclear fires may be burning low and that it is slowly shrinking. The most recent report suggests that the sun has been dwindling for more than a century.

This could mean that, contrary to what had been believed, the sun's energy does not come entirely from the fusion of atoms of hydrogen into helium, the process that fuels the hydrogen bomb, but is liberated partly by the sun's contraction. The shrinking is estimated to be about 8.3 miles of the sun's 865,000-mile diameter each year.

The apparent shrinkage is only one-tenth of 1 percent a century, but that is enough that, had it remained constant throughout the sun's lifetime of 4.6 billion years, the star would have long since vanished. Based on this, some astrophysicists, such as Dr. Martin Schwarzschild of Princeton University, suspect a long-term cycle of expansion and contraction.

The sun is the ultimate source of the Earth's energy. Whether such cycles have been responsible for the great climatic changes of the distant past remains to be determined.

If the apparent shrinkage is confirmed, said Dr. Thomas Corbin of

the U.S. Naval Observatory, "astrophysicists will have a lot of explaining to do."

The evidence so far consists largely of measurements taken at various observatories since the 19th century. It has been compiled by Dr. John Eddy of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., and Aram A. Boornazian, a computer specialist with S. Ross and Co. of Boston.

In an analysis of solar measurements made by the Royal Greenwich Observatory in England from 1836 to 1953, they found a relatively uniform shrinkage in both the vertical and

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JULY MEETING NOTICE FOR P. A. C.

This month's meeting of the Prairie Astronomy Club will be held at Hyde Observatory on Tuesday night, July 31, at 7:30 p.m.

Highlight program this month will be about 1 hour of JPL transmissions from Voyager 2's recent flyby of Jupiter, videotaped from the satellite feed. This is a recording of the astronomical event of the summer, so you won't want to miss it.

Hyde Observatory Committee will meet at 6:30 p.m.

PRESIDENT'S REPORT:

I'd like to use this space this month to make a personal announcement to all of my friends in the Astronomy Club: My wife, Cindy, and I are happily preparing for the birth of our first baby. The little astronomer should make an appearance sometime in February. We're really excited about it and, of course, I've explained to Cindy how now we have to start saving up to buy the kid a really nice big telescope with all the accessories, immediately. I've also explained that I'll be glad to use it until he/she is old enough to appreciate it...just so it won't go to waste, you understand. But now Cindy seems to think that I'm unscrupulously taking advantage of a happy occasion like the birth of a baby to get myself a new telescope!! Well, I don't know, I...

Anyway, DON'T FORGET THE STAR PARTY/PICNIC on Saturday, August 18, at Wagon Train Lake picnic grounds near Hickman. The club will supply the pop and you should bring your own food (or enough of your specialty to share with others) and eating utensils. You should also bring along all the other typical picnic paraphernalia: frisbees, blankets, lawn chairs, balls and gloves, a swimsuit (if you want to swim in the lake), and, of course, your TELESCOPE. We plan on arriving around 5:00 or 6:00 p.m. and eating around 6:30. That leaves plenty of time for setting up the scopes before nightfall. We haven't yet set an alternate date, in case of bad weather. We'll do that at the meeting. If it's cloudy on August 18 and you don't know the alternate date, call one of the club officers. To get to the picnic grounds, just head out south on 56th Street, and follow the signs to Hickman and Wagon Train Lake. If you need a ride, call me or any of the officers and we'll find you one. This annual event is always a lot of fun, so plan on attending.

--RON VEYS

THE PRAIRIE ASTRONOMER is published monthly by the Prairie Astronomy Club, and is free to club members. Yearly subscription without club membership is \$4.00. Regular membership (includes one-year subscription to Sky & Telescope, club newsletter, and four quarterly issues of the Astronomical League newsletter), is \$12.00. Family membership (includes all regular privileges, plus one additional vote in club elections) is \$14.00. Newsletter editor, Lee Thomas, 489-3855. Address all correspondence to PRAIRIE ASTRONOMY CLUB, INC., P.O. Box 80553, Lincoln, Nebraska 68501.

THE BARLOW LENS -- PART 4 ... By Larry Stepp

In the third part of this series I discussed the effect a Barlow lens has on the exit pupil of a telescope, and showed that eye relief is increased when a Barlow is used. Imagine now what would happen if the Barlow lens is moved closer to the eyepiece. The magnification would decrease, and the exit pupil would not only get larger, it would also move farther from the eyelens. If the Barlow lens is moved until it lies exactly at the prime focus of the objective, it could not magnify at all (if you don't believe this go back to the equations given in the first installment of this article.)

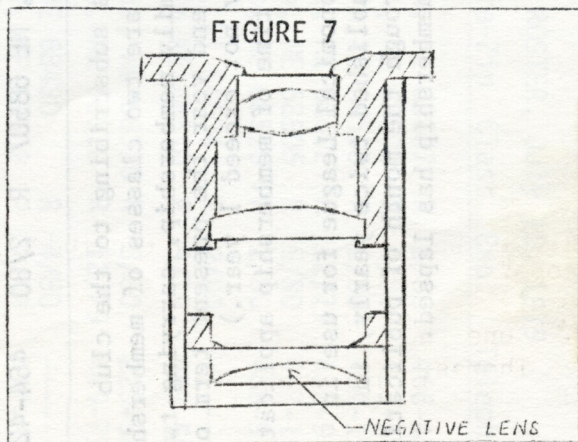
Let's calculate what has happened to the position of the exit pupil. The virtual image of the objective is found by $h = 1 / (1 / (-100) - 1 / (48 \times 25.4))$ or $h = 92.4\text{mm}$. Then $g = 1 / (1 / 20 - 1 / 92.4 + 20)$ or $g = 24.3\text{mm}$. The exit pupil has moved 4mm farther from the eyelens than it was without the Barlow, with no change of magnification. If the Barlow lens had a shorter focal length the effect would be more pronounced, so for example, if the lens of focal length -100mm is replaced by a lens with a focal length of -50mm, the increase in eye relief is 8mm instead of 4mm.

This effect can be used when making an eyepiece for a finder or spotting scope where good eye relief is important. A negative lens can be attached to the focal plane stop of

the eyepiece (see figure 7). I would recommend a plano - concave lens of 25mm diameter and a focal length of about -100mm, preferably coated. There is one disadvantage of this method, and that is that if the lens is at the focal plane any dust on the lens is very annoying, so the eyepiece must be kept as clean as possible.

Now, let's discuss some other applications of Barlow lenses. As you know, besides being used for visual work, Barlow lenses are often used when taking photographs through the telescope, to get a larger image. This approach, called Barlow projection, generally works better than eyepiece projection for low magnification factors. The Barlow is inserted in the eyepiece holder just as it would be for visual work, but a camera is mounted in place of the eyepiece

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31. Kris Miller	1149 So. 17th St.	Lincoln, NE 68502	R	5/80	435-4051
32. C. L. Moore	1140 No. 79th St.	Lincoln, NE 68505	R	9/79	466-1886
33. Earl Moser	-----	Hickman, NE 68372	R	9/79	792-2260
34. Neville Murray	2815 Pear St.	Lincoln, NE 68506	R	10/79	-----
35. William F. Norris	2832 Manse Ave.	Lincoln, NE 68502	R	1/80	435-0267
36. Tom Peterson	6161 So. 70th St.	Lincoln, NE 68516	R	12/79	423-2307
37. Donald S. Phillips	5201 Claire Ave.	Lincoln, NE 68516	R	10/79	489-7637
38. Mark Powell	3310 Cooper St.	Lincoln, NE 68506	R	1/80	489-6114
39. Mary J. Rehm	649 So. 18th, Apt. 26	Lincoln, NE 68508	R	4/80	475-4953
40. Carroll Reinert	3895 Sheridan Blvd.	Lincoln, NE 68506	R	1/80	483-1093
41. Curtis Roelle	6831 Bethany Park Dr.	Lincoln, NE 68505	R	3/80	464-2346
42. Merton Sprengel	4522 Hillside St.	Lincoln, NE 68506	F	9/79	489-3177
43. Larry Stepp	3122 Oak Hill Rd.	Carrollton, TX 75007	R	5/80	245-7647
44. L. Lee Thomas	5827 LaSalle St.	Lincoln, NE 68516	R	9/79	489-3855
45. Steve Traudt	2726 Washington St.	Lincoln, NE 68502	R	2/80	435-7617
46. Ronald B. Veys	940 Colony Ln.	Lincoln, NE 68505	R	1/80	464-1449
47. Morris Weiss	4010 Woods Blvd.	Lincoln, NE 68506	R	10/79	423-7683
48. Ed Woerner	419 So. 48th St.	Lincoln, NE 68510	R	2/80	489-4458
49. Jerry L. Workman	7119 Havelock Ave.	Lincoln, NE 68507	R	2/80	464-4256

The above list includes only club members. Persons subscribing to the club newsletter without membership are not included. There are two classes of membership: "R" is a regular member (dues are \$12.00), "F" is a family membership, carrying two votes (dues are \$14.00). Expiration date is the month and year the present term of membership is up for renewal. (Terms of membership may not exceed 1 year.) Telephone numbers are those provided by members at the time of membership application or renewal.

This official club roster is submitted to the Astronomical League for use in their official mailing list. Membership rosters are published twice yearly, in January and July. Only members whose dues are paid through the month of publication are included. If your name is not on this list, your membership has lapsed.

PRAIRIE ASTRONOMY CLUB MEMBERSHIP ROSTER, July 15, 1979

Name	Address	City-State-Zip	Class	Exp.	Telephone
1. Donn Baker	2616 No. 59th St.	Lincoln, NE 68507	R	8/80	466-4309
2. Walter Baumann	2305 MariLynn Ave.	Lincoln, NE 68502	R	4/80	423-5740
3. Janet Beason	7230 Eastborough Ln.	-Lincoln, NE 68508	R	2/80	464-1950
4. Michael Benes	722 Hill St.	Lincoln, NE 68502	R	12/79	432-9179
5. Roger Besch	1030 No. 78th St.	Lincoln, NE 68505	R	5/80	467-1532
6. Brad Binder	415 Lyncrest Dr.	Lincoln, NE 68510	R	2/80	488-9193
7. Felix Cavosie	911 Division St.	Hurley, WI 54534	R	2/80	-----
8. Dr. John Clothier	355 So. Cotner Blvd.	-Lincoln, NE 68510	R	9/79	488-5608
9. Allen Daubendiek	1821 Jackson St.	Beatrice, NE 68310	R	3/80	225-5863
10. Budd DuvalI	1015 So. 40th St.	Lincoln, NE 68510	R	12/79	489-7933
11. Rollin Ellis	RFD	Roca, NE 68430	R	4/80	-----
12. Ed C. Epp	2110 A St.	Lincoln, NE 68502	R	2/80	477-8105
13. Harlan Franey	1734 So. Cotner Blvd.	-Lincoln, NE 68506	R	1/80	488-0085
14. Norman D. Frerichs	1423 Lincoln St.	Beatrice, NE 68310	R	8/79	-----
15. Dick Hartley	320 Wedgewood Dr.	Lincoln, NE 68510	R	10/79	489-4105
16. Phillip D. Hauptman	630 So. 28th St.	Lincoln, NE 68508	R	10/79	432-8192
17. Duane Hutchinson	3445 Touzalin Ave.	Lincoln, NE 68507	R	11/79	466-4988
18. Clifford Johnson	P.O. Box 133	Trenton, NE 69044	R	8/79	-----
19. Richard Johnson	1860 Pawnee St.	Lincoln, NE 68502	R	9/79	423-6726
20. Junior League of Lincoln c/o Trixie Schmidt	3727 Stockwell St.	Lincoln, NE 68506	R	4/80	489-3671
21. Steve Kell	RFD #8	Lincoln, NE 68506	R	8/80	-----
22. Werner Klammer	1658 No. Columbia St.	-Seward, NE 68434	R	9/79	-----
23. David Knisely	1616 No. 14th St.	Beatrice, NE 68310	R	12/79	472-0424
24. Kenneth Kopta	1544 Crestline Dr.	Lincoln, NE 68506	R	3/80	489-3005
25. John Lammers	1007 8th St.	Fairbury, NE 68352	R	12/79	472-8939
26. Allan Logan	1235 No. 16th St.	Lincoln, NE 68508	R	2/80	432-4337
27. John B. Lortz	2800 No. 50th St.	Lincoln, NE 68504	R	4/80	466-2721
28. Dick McCann	2425 Sewell St.	Lincoln, NE 68502	F	4/80	477-4947
29. Richard McClain	3235 W. Pershing Rd.	-Lincoln, NE 68502	F	12/79	423-7473

30 Dr R A Manthov 61st & O-Gatmanv 1 Incoln NE 68505 E 070 400 3937

BARLOW LENS, Part 4

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piece (see figure 8).

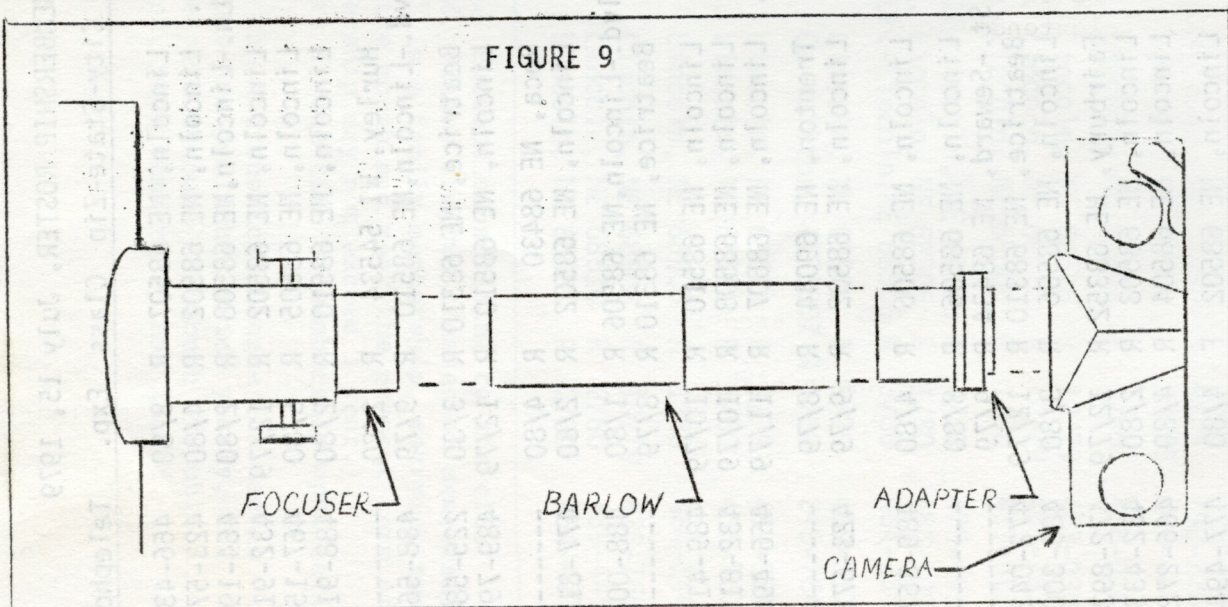
There are several advantages of this technique. The entire set up is relatively short and therefore steady, it is possible to get a large fully illuminated field on the film, and the image quality is good, for low magnification factors with ordinary commercial Barlow lenses. However, there are also several minor disadvantages. The Barlow tube needs to be securely clamped in the eyepiece holder, because it must support the full weight of the camera. A $1\frac{1}{4}$ inch adapter is needed to couple the camera to the Barlow tube, and the adapter in turn must be securely clamped in the tube. It is difficult to determine the exact magnification

factor of the combination, which will invariably be greater than the rated magnification of the Barlow lens because of the spacing. This also means that a Barlow that will come to focus in the eyepiece holder when used visually, may not reach focus when used for Barlow projection unless the primary telescope mirror is moved up.

I have a suggestion for a slightly different way to set up Barlow projection which eliminates some of these problems. Several camera equipment manufacturers make an accessory known as a telextender (or telephoto converter, or teleneegative amplifier.) These are in fact nothing more than a Barlow lens mounted in a tube which couples to a single lens reflex cam-

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FIGURE 9



BARLOW LENS--From Page 6

era. A telextender is normally used with a telephoto lens to double (or triple) the magnification. This is exactly the same thing as Barlow projection. So why not use a telextender on a telescope? The same $1\frac{1}{4}$ inch adapter which fits the camera will fit the telextender to the eyepiece holder, and the camera attaches directly to the telextender. This provides an assembly which is relatively short (the focal length of a telextender is usually less than that of a commercial Barlow lens), is quite solid, and is easy to use. In addition the telextender is designed to be parfocal with the camera, which means that if the eyepiece holder is adjusted so that the camera is in focus when used at prime focus, it will still be in focus (approximately) if the telextender is inserted. If used in this way, the magnification factor is known to be the same as the rated magnification of the telextender, and you can be sure the image will come to a focus within the range of the eyepiece holder. I have used a telextender in this way on my 4 inch refractor with good results, but I have not actually compared image quality carefully between a good commercial Barlow lens and a telextender, nor have I tried using two telextenders in series to get 4X the way Rick Johnson uses two Barlows. Making these comparisons would be a good club project if anyone is interested.

In the next part of this series,

LESS ENERGETIC, SHRINKING SUN

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horizontal diameters of the sun.

Such a trend was then found in similar measurements made by the Naval Observatory since 1846 but in its records the shrinkage rate on the vertical axis was 50 percent faster.

Astronomers at the Naval Observatory said in interviews that this discrepancy indicated the difficulty of determining slight changes in the solar diameter. The heat of the sun affects the instruments used to make the measurements and any change in instruments or method can introduce a bias.

Some theorists now propose there may be a long-term cycle of shrinkage of the sun in which the energy derives chiefly from contraction, followed by a period of expansion under the influence of revitalized fusion reactions.

A possible confirmation of long-term shrinkage of the sun has been identified in the report by Clavius, an early chronicler, of the solar eclipse in 1567.

Computer calculations show that it should have been total --the sun completely hidden by the moon. Instead it was "annular", said Clavius ...the rim of the sun was clearly visible, indicating that the sun was bigger than than the computer has been led to believe it is now.

I will describe other applications of Barlow lenses.

TELESCOPES FOR SALE...

TELESCOPE- 4-inch Cable (brand), f/6, good beginner scope. Reflector. \$60. Call Kris Miller, 435-4051

FOR SALE - Empire (brand) 60mm Refractor, focal length 700mm. Includes star diagonal, finder scope, 2X Barlow, 5.5mm eyepiece, 15mm eyepiece, alt-azimuth mount, wooden tripod. Brand-new condition. Sells new for \$90, will sell for \$60 or offer. Contact Ron Veys, 464-1449.

FOR SALE - Tasco (Brand) 50mm, f/12 refractor, focal length 600mm. Includes star diagonal, 4X15 finder; 20mm, 12.5mm, and 6mm eyepieces; alt-azimuth mount; small metal tripod. Will sell for \$25 or offer. Contact Ron Veys, 464-1449.

STAR PARTY REMINDER: Annual P.A.C. Starparty & Picnic, Wagontrain Lake (East of Hickman), Saturday, August 18. Bring 1 main dish or salad or dessert and dinner service. Dining begins at 6:00 p.m. Set up telescopes at sunset. Lookout parking lot. State Rec sticker or fee necessary.

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9/79

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