

THE FOCAL POINT

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The Newsletter of the Atlanta Astronomy Club

December 1989

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CLUB CALENDAR

Next Meeting: December 8, 8:00 p.m. at Bradley Observatory.
Program: Club members Dr. Ralph Buice and Steve Gilbreath will talk about "A Tour Of Mauna Kea: The Observatory Above The Clouds". They will discuss their recent trips to the 14,000 foot high site as well as visits to several other famous observatories.

Observing Session: December 30 at Villa Rica.

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Richard Jakiel, Mark Lancaster

The **Focal Point** is published monthly during the academic year by the Atlanta Astronomy Club, Inc. The AAC is a non-profit organization dedicated to the advancement of amateur astronomy. Meetings are held the third Friday of each month (except the second Friday in December) at the Bradley Observatory on the Agnes Scott campus. Dues are \$35 annually for a family membership and \$25 for a student membership and include a subscription to *Sky & Telescope* magazine and use of the club observatory in Villa Rica.

Submissions: Article submissions are welcome, and may be delivered to the editor for consideration. Articles on computer floppy disk are encouraged.

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THE CASUAL ASTRONOMER: DECEMBER 1989

by Hal Crawford

Space Exploration - Challenges and Curses

I'm not going to do all the talking in this column today. This month's column is dedicated to this wonderful article I found in the July 31, 1989 issue of *InfoWorld Magazine*. Thanks to the kind permission of the copyright editor (I have to say this: Copyright 1989 by Infoworld Publishing Corp., a subsidiary of IDG Communications, Inc. Reprinted from *InfoWorld*, 1060 Marsh Road, Melo Park, CA 94025.), the most significant portions of the article are being reprinted for your review. A noted science fiction writer and computer columnist, Jerry Pournelle speaks far more eloquently of the future of American space travel than I can. Read it and pass the word -- this is what it's going to take to get back in space!

We Can Return to the Moon and Mars - This Time to Stay

by Jerry Pournelle

Twenty years ago we all sat huddled around television sets, breathlessly waiting first for a voice to say "Houston, Tranquility Base here. The Eagle has landed." Then, a lifetime later, a voice said through the static, "That's one small step for man, one giant leap for mankind."

On that afternoon there was nothing we couldn't do, and we knew it.

Now it has all changed. We can't go back to the moon, not in this millennium and certainly not for under a hundred billion dollars. In fact, there's very little we can do, and if we don't know that, there are plenty willing to rub our faces in it.

In fact, things came apart quite a while ago. My last professional work in the aerospace industry was designing experiments for Apollo 18 -- a mission that never flew. Instead, NASA took the Saturn 5 rocket, a fully operational man-rated bird, the most powerful machine ever built by mankind, and laid it on its side as a lawn ornament. You can see it outside the Lyndon B. Johnson Space Center in Houston to this day. At least the owls who roost in it know what to do with it. NASA certainly never did.

It being the 20th anniversary of Apollo 11, President Bush had to say a few words, and indeed, given the uncertainties rampant in NASA's halls, he did rather well. We will, he said, go back to the moon, this time to stay, and from there we'll go to Mars -- all of which is true. What he didn't say is when we'll do that or how much it will cost, because his advisers don't seem to know.

Let me try.

There are several ways to get to the moon. One would be to choose a suitable dedicated non-profit -- the Lunar Society would be my choice, but then I'm its chairman -- hand over \$2

billion, and get out of the way. We'd have a lunar settlement within eight years and probably a lot sooner.

Of course, we aren't likely to do that, although I've met few people in the industry who think it wouldn't work.

Next, we could go to one of the big aerospace companies -- nearly any one of them would do -- hand over \$2 billion, and say, "You get another \$4 billion as soon as 40 people have spent a year and a day continuously on the moon. You won't get any more money no matter what you do, and you don't get another cent until the job's done."

I know of at least two major aerospace firms willing to compete for that contract. For that matter, we don't even need contracts: Congress could simply appropriate \$8 billion, to be paid to the firm or consortium of firms that first succeeded in building a lunar settlement of 40 people and keeping it going for a year and a day. We'd get a race going, with half a dozen competing companies.

Of course we won't do that either.

Next up the ladder is a "skunk works" operation: a small program office, kept lean and mean with a sunset clause -- it goes away in seven years whether it gets the job done or not. Cost estimates on that vary, but I've heard numbers from \$12 billion to \$18 billion, with the higher figures coming in if we have to live with all the procurement regulations. The government, in case you didn't know, is willing to pay a civil servant \$700 a week in order to insure that a project doesn't buy a \$300 hammer every week for six weeks.

Finally, you can ask NASA to do the job. NASA's official estimates are over \$80 billion, with completion well after the end of this millennium.

The interesting part is that while some will quibble with the exact numbers, I've met no one in the aerospace business who seriously quarrels with my cost and schedule estimates. There are a few who say my \$2 billion, if done by a nonprofit, is low, but interestingly the people who'd actually have to do it think it's probably high. I got the number from the Columbus Project. This was a proposal by Stanford's John McCarthy and Livermore's Lowell Wood and Rod Hyde: Given 10 shuttle missions, they were quite certain they could build a lunar settlement for half a billion dollars, which is the kind of money that can be raised in a major university capital fund drive. It was called the Columbus Project because it was to have been completed in 1992, the 500th anniversary of Columbus' voyage. That was all before the Challenger disaster, of course. Now there aren't any spare shuttle flights. For that matter, there aren't very many shuttle flights at all.

Anyway, I took the Columbus Project numbers, added a billion dollars for development of the SSX spaceship, including procurement of a fleet of three ships, and added another half billion for fuel and other transportation costs. The result is \$2 billion, which happens to be twice the cost of SSX.

Of course, there are times when I have my doubts. I work the numbers...I prepare the briefings...and give them to anyone who'll listen, all the time waiting for someone to ask a question my technical people can't answer, and so far, somewhat to my surprise but much to my delight, everything holds up. We really could do it, and it wouldn't take any ten years to do it, either.

Which shouldn't really surprise us: After all, we went to the moon the first time in eight years, and when we started we didn't know how or even if it could be done.

Anyway, last week the SSX spaceship got through a major technical review by an independent organization, and it not only passed but won the enthusiasm of much of the study team. As I've always thought, there are never any technical showstoppers. There are only organizational and political barriers, which may indeed be insuperable, but they don't have to be.

Pournelle's Law: What man has done, man can aspire to. In well under four years we built the P-51 and P-47 fighters, both more complex than the SSX; the Polaris submarine system; the Thor ballistic missile system; and the SR-71 airplane. Every one of those had more technical unknowns than SSX; and given SSX -- which is a recoverable spaceship designed around operations constraints to make it run like an airplane rather than like a shuttle -- given SSX, the moon becomes a simple operation.

It takes the same fuel to fly a pound from Los Angeles to Sydney, Australia, as it does to put that pound into orbit. A spaceship that operates like an airplane should and can get a pound to orbit for about the same cost as to fly that pound to Sydney. Getting that pound to the moon takes 10 times as much fuel as it does to get to orbit, which means about 10 times the cost of flying to Sydney. Of course, this is not cheap, but it is certainly not impossible.

Our industry can't operate without a steady supply of bright, well-educated people. Where are we to get them? What inspires young people to opt for technical education, the ultimate in deferred rewards? Why study algebra when the sun is shining and no one cares anyway?

Apollo was an inspiration. I can't prove it, but I strongly suspect that the space program of the '60s inspired the students who became the movers and shakers of the micro industry in the '70s and '80s; and a renewed space program will produce the leaders of the '90s. What else can?

In 1949 while I was in high school, I found a copy Willy Ley's *Rockets and Space Travel* in the library. I wrote a book report that was ridiculed by my fellow students. No one was going to fly rockets into space. No one was going to the moon. I had faith, though. I was sure that I would like to see the first man on the moon; and sure enough, 20 years after I read Willy's book (and tragically a few months after his death) Neil Armstrong took one giant leap for mankind.

A lot has happened in the 20 years since then. The nation has changed. Now we spend money we don't have, not as an investment for the future but just to make things more comfortable -- in order to avoid the hard decisions. It's easier just to shovel out the money and let our children worry about paying it back. Most of us are too busy to think about that anyway.

But it was a giant leap for mankind. Let's do it again. We know how.

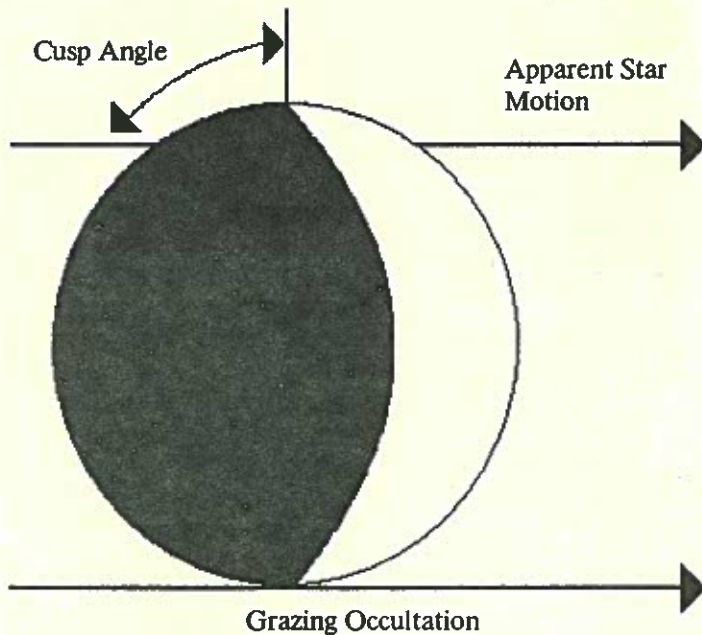
TOTAL OCCULTATIONS OF BRIGHT STARS IN 1990

by Mike Kazmierczak

1990 is already upon us and here is the first of two occultation articles. Since I have already received my total occultation predictions for the new year, I'll mention them first.

"What are total occultations?" you might be saying. We all know that the moon moves with respect to the stars. As the moon passes between the earth and a distant star, it 'eclipses' it. Not that the shadow is very noticeable, the star will blink off as it passes behind the disk of the moon and reappear from the other side. These disappearances occur on the dark limb before full moon and on the bright limb after. Conversely, reappearances are on the bright limb before full moon and on the dark limb afterwards.

The columns contain the following information. The date and time are in EST/EDT. The predicted times are for my location in Conyers, so depending on the event and your posi-



tion, the time at your location could be up to 5 minutes earlier or later in an extreme case. Also, near grazing events for me could be missed elsewhere (Mar 19). The PR column is phenomena and rating. D is for disappearance and R is for reappearance. The rating ranges numerically from 1 (faintest) to 9 (brightest). These are all the 9 rated total occultations for this area. Star # is the ZC star identification number, used for reporting the data. Magnitude is the object magnitude. PCT is the percent of moon sunlit, "+" being waxing and "-" waning. MN is the moon altitude and SN is the sun altitude both in degrees. The sun altitude is only given when the sun is more than 12 degrees below the horizon. CA is the cusp angle. This is where the event is going to take place on the moon. The terminator is the line dividing bright and dark parts of the moon. The cusp is merely where the terminator and the edge (limb) of the moon meet. The N or S indicate northern or southern cusps. The sign of the

CA indicates dark limb (+, easier to see) or bright limb (-, harder to see). The number is the number of degrees around the moon to the place of the event. This data is needed for reappearances so one will know where to look for the event. These stars are so bright that there will be no others to confuse them with. Notes are just to tell you other things about the events.

As you can see, we have several planets occulted this year and a night with five totals rated 9. This data is provided for observational enjoyment purposes. If you would like to collect astronomical data in one of the few areas where amateurs make a major contribution, give me a call at 760-8502 and I'll get you started.

Stay tuned for next year's grazing occultations (March 19 appears to be the graze of the year!)

OCCULTATIONS OF BRIGHT STARS IN 1990

DATE	T(UT)	PR	STAR #	MAG	PCT	MN	SN	CA	NOTES
FEB 26/19:03	D9		3512	5.8	3+	14	-8	88N	
MAR 02/22:49	D9		0538	5.6	39+	23		84N	
MAR 02/23:15	D9		0542	5.8	39+	18		27S	
MAR 02/23:23	D9		0543	6.5	39+	16		16S	
MAR 17/00:53	R9		2263	4.8	71-	9		80S	
MAR 17/05:42	R9		2287	3.0	70-	29		14N	
MAR 19/ 6:06	G9		2554	4.4	51-	28	-8	3N	Near E. Atl.
MAR 21/05:18	R9		2861	5.7	32-	18		49S	
MAR 22/13:45	D9		4004	1.3	20-	8	54	-75S	Mars; daytime
APR 01/00:00	D9		0844	5.7	36+	10		43N	
APR 02/01:45	D9		1030	3.2	48+	1		47	

** ALL TIMES BELOW ARE EDT **

APR 17/05:44	R9		2809	4.9	59-	28		65N	
APR 29/20:41	D9		1092	5.8	31+	57	-5	50S	
JUN 07/01:04	D9		2287	3.0	98+	30		57S	
JUL 16/04:55	R9		0311	6.5	40-	45		74N	
AUG 14/01:44	R9		0536	5.4	43-	12		59N	5 totals
AUG 14/01:45	R9		0537	3.8	43-	12		82S	Don't miss it!
AUG 14/02:08	R9		0541	4.0	43-	17		60N	
AUG 14/02:31	R9		0549	6.3	43-	21		39S	
AUG 14/02:31	R9		0552	3.0	43-	21		33S	
AUG 17/04:51	R9		1070	5.2	12-	12		45S	
AUG 18/07:41	D9		4005	-1.4	5-	32	8	-24S	Jupiter
AUG 18/08:11	R9		4005	-1.4	5-	38	14	26S	Jupiter
SEP 13/03:46	R9		1030	3.2	33-	24		81N	

** ALL TIMES BELOW ARE EST **

NOV 03/22:33	R9		0537	3.8	97-	51		52N	
NOV 03/23:48	R9		0552	3.0	97-	66		81S	
NOV 04/00:17	R9		0560	3.8	97-	71		35S	
DEC 11/05:47	R9		1852	6.0	27-	34		72N	
DEC 22/18:46	D9		3285	6.1	28+	41		70S	
DEC 28/20:28	D9		0537	3.8	89+	70		77S	
DEC 28/21:05	D9		0541	4.0	90+	76		67N	

BOOK OF THE MONTH CONTINUES!

by Hal Crawford

Response to Guy Ottewell's Astronomical Calendar 1990 as been very good. The order was placed during the last week in November, and we expect the shipment shortly

. Those of you who have placed orders will be contacted as soon as they come in.

The November Book of the Month was announced by our esteemed president Leonard Abbey at the November meeting due to my absence and lack of space in the November

Focal Point. That book is the Observer's Handbook 1990, published by the Royal Astronomical Society of Canada. This manual receives kudos from many AAC members. Copies are only \$11.00. Orders will be placed later this month.

The December Book of the Month is the Air & Space Catalog, a new book published by Random House. This guide actually covers four main areas: Astronomy, Weather, Space Flight, and Aviation. Each of these areas contain an abundance of useful information. To completely describe the topics would be impossible, but this

book certainly belongs on the bookshelf of the avid astronomer. The book is available in softbound at \$17.00; hardbound versions are also available. The order will be placed after the January meeting.

If interested in either book, inform Hal Crawford at the next meeting or call him at 320-9156 to place your order.

In addition, thanks to a special arrangement only for astronomy clubs, Astronomy Magazine is now available by group subscription. A subscription for the Mar-Dec 1990 fiscal year (10 issues) is \$11.80 (subscriptions are only available on a yearly basis). Interested members should contact Hal (again) at the above number or see him at the December meeting. Orders will be placed immediately after the December meeting!

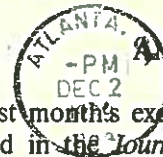
PROGRAM PREVIEW

This month's program is entitled "A Tour Of Mauna Kea: The Observatory Above The Clouds"

Two Atlanta Astronomy Club members, Dr. Ralph Buice and Steve Gilbreath, share some of their slides of their visit to one of the great observatory sites in the world -- the location of the 144-inch Canada-France-Hawaii telescope on the summit of a 14,000 foot extinct volcano on the island of Hawaii. Slides of three other observatory sites within the continental United States will also be shown; the famous 200-inch telescope of Mount Palomar, the solar observatories of Mount Wilson, and the 158-inch telescope located at Kitt Peak Observatory in Arizona.

As the problems of light pollution and smog encroach on many of our best observing sites, many astronomers seek the clearer skies of Mauna Kea's summit, a lofty perch still far removed from the everyday civilized world. Unfortunately, the more remote the site the more difficult the access, and the Mauna Kea observing site can be reached only by 4-wheel drive vehicle, after negotiating a treacherous dirt road which is often covered with ice and snow. In addition, access to these special observatories is usually highly restricted, and the "behind-the-scenes" view of these telescopes should be a special treat.

Battling the ice and snow, the high winds atop the volcano, the lack of oxygen, and the beaches of Waikiki, our intrepid club members have returned from their adventure in Hawaii to bring us this program for our next club meeting.



AND FURTHERMORE...

Last month's excellent lead article by Larry Klaes first appeared in the *Journal of the Astronomical Society of the Atlantic*.

THE FOCAL POINT**First Class Delivery**

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