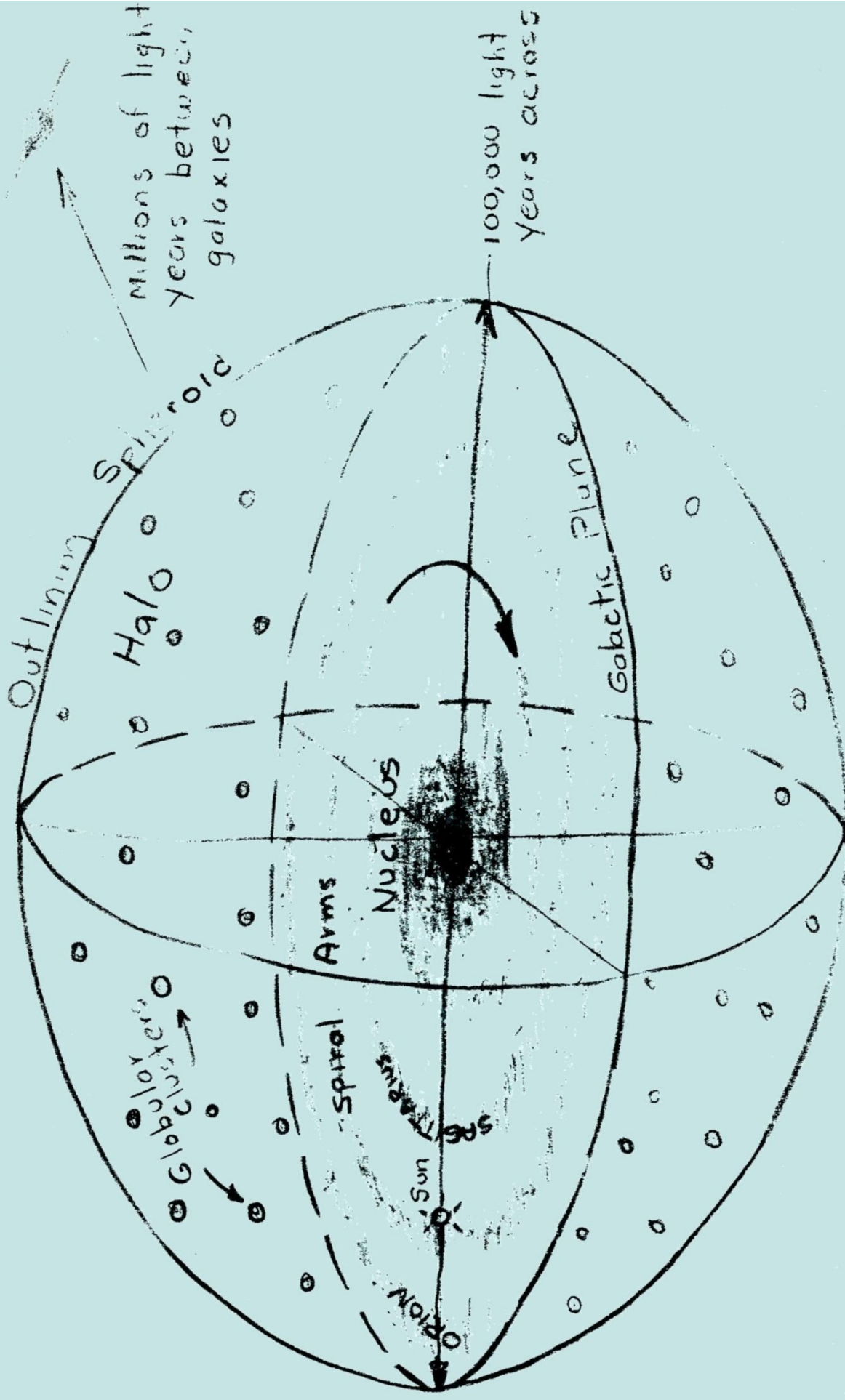


The Milky Way - Our Galaxy



The wasp

THE MONTHLY JOURNAL OF THE WARREN ASTRONOMICAL SOCIETY

May 1974

APRIL 1974
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Warren Astronomical Society

MAY Calendar

1974

JUNE
S M T W T F S
2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p>Camp Out at Bald Mountain. Fishing - Camping - Hiking - Baseball - AND AT NIGHT!</p> <p>TELESCOPING 24-25-26</p> <p>5 STARGATE CLEAN UP PICNIC 2:00 P.M. AT CAMP ROYNEY FALL 7:00 P.M.</p>	<p>1</p>	<p>2 Measur Club 8:00 P.M. INFO. 791-8752</p>	<p>3</p> <p>SCOUTS - ROTARY</p> <p>KALAMAZOO ASTRO-SOCIETY MEETING</p>	<p>4</p>	<p>10</p> <p>9 Astro PHOTO MEETING 8:00 P.M. INFO. 776-9120</p>	<p>11</p>
<p>12 Mother's Day</p>	<p>13</p>	<p>14 LAST QUARTER</p> <p>SCOUTS - ROTARY</p>	<p>15</p>	<p>16 W.A.S. GENERAL MEETING 8-311 8:00 P.M. 791-8752</p> <p>17 S.S. Toledo</p>	<p>18</p>	<p>25 Corp's Meeting</p>
<p>19 DETROIT ASTRONOMICAL SOCIETY MEETING SPEAKER FRANK McCULLOUGH</p>	<p>20 Victoria Day (Canada)</p>	<p>21 New MOON</p>	<p>22</p> <p>SCOUTS - ROTARY</p>	<p>23</p> <p>Ascension Day</p>	<p>24</p> <p>W.A.S. Camp Out</p>	<p>25</p>
<p>26 at Bald Mountain</p> <p>INFO. CALL 791-8752</p>	<p>27 Memorial Day</p>	<p>28 1ST QUARTER SANDY</p>	<p>29</p> <p>[4 more months till 1974 National Convention]</p>	<p>30</p>	<p>31</p>	<p>MAY</p>

Some Recent Observations

by

Kenneth Wilson

On the evening of April 6, 1974 Larry Kalinowski and I met at Camp Rotary to attempt to observe Comet Bradfield (1974b). Despite the full moon and thickening haze, we had little trouble in finding it. It had a condensed coma and, even though it was not as condensed as Comet Kohoutek's, it was still almost star-like. A tail was barely visible in the bright moonlight. I estimated that less than 1° of tail was visible. Larry estimated the comet's overall magnitude as being fainter than $5\frac{1}{2}$.

On April 9, 1974 I was invited to accompany Jim Loudon and his astronomy class on an observing trip to the University of Michigan's 52-inch reflector on Peach Mountain. The highlight of the session was the observation of the planet Pluto. Using the finder chart in the April issue of Sky & Telescope, a graduate student with a little assistance on my part found the planet easily. In the $\frac{1}{4}^\circ$ field of the main instrument, Pluto was the brightest object visible. The transparency was good but seeing was poor and Pluto (which should have been a point source) was distorted into a ragged disc. In all, approximately twenty people had a chance to see Pluto. We feel that we may have doubled the number of people (in the U.S. at least) who have visually seen Pluto in this one observing session.

Spiral structure in M51 was also clearly seen on that evening.

OBSERVATIONAL ASTRONOMY

by
Frank McCullough

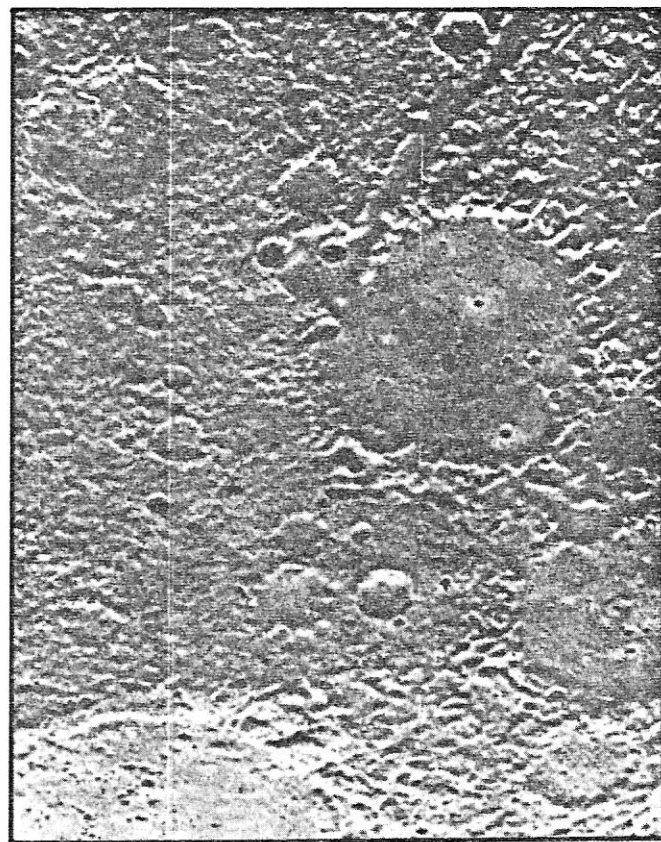
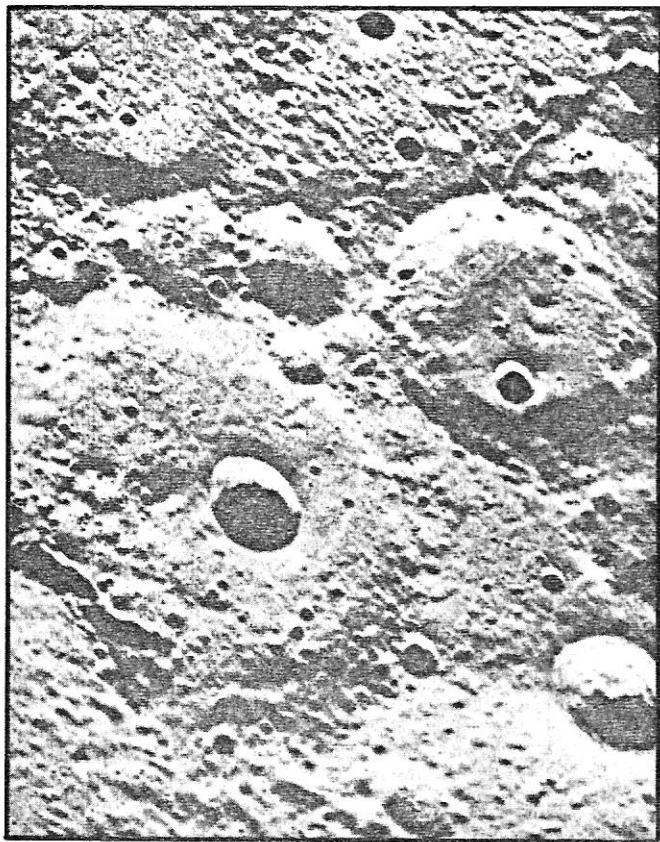
Observations of Comet Bradfield (1974 b)

On the evening of April 9th, I had my first chance to observe Comet Bradfield, from my front yard in Fraser.

I had to wait till 9:30 before I could get my first view of the impressive comet, when the time came though I ventured forth with my handy dandy 7x35 binoculars and started sweeping just northeast of the stars γ Andromedae and β Perseus, where they were observed three days earlier by Larry Kalinowski and Ken Wilson. After several sweeps where I thought it should be, I kept coming across a loose cluster of stars, further observation showed a tiny fuzzy object with a tiny plume sticking straight up away from the sun. I then went to my 8" f8 using my 28mm eyepiece, looked through my finder came across the same star grouping and the object followed close behind. When I looked through my scope it was not there, many thoughts went, through my mind about then, but with a little movement of the scope a beautiful comet appeared before my eyes! Very much resembling the famed Comet Cow hooooo tec, the wide fan shaped tail could be vaguely seen. The comet had a bright nucleus with a bright jet coming off the left side as seen through the telescope. Predicted magnitude at this time by the A.L.P.O. was to be 7th, but Larry, Ken, and myself tried our hand at determining the magnitude and were surprised to find it holding up at a whopping 5.5 to 5.8 magnitude. It has now moved away from the stars 63, 64, 65 and 66 in Andromeda and sped out into Cassiopeia at R.A. 2h 31m Dec. +64 42.



The Strange and Cratered World of Mercury



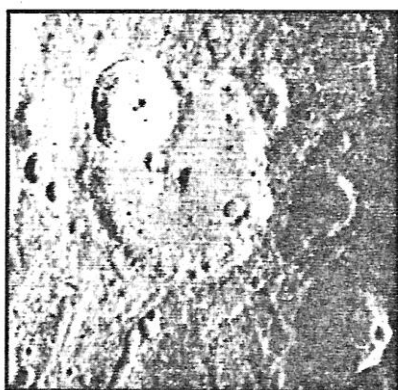
Craters, hills and valleys: A moonlike surface on a not-so-moonlike planet. Width of areas shown is about 100 miles.

Until last week, the majority of planetologists felt, with good reason, that Mercury was a pretty nothing planet. No atmosphere (the solar wind would blow it away), no magnetic field (the planet's slow rotation would not create the dynamo effect necessary to sustain one), no ionosphere (no magnetic field to trap the ionized particles), no moons. All in all a dull world.

Now it is "strange," "startling," "spooky," and "fascinating," all thanks to a few days of observations by Mariner 10.

The first spacecraft ever to fly by Mercury has taken close-up photos that reveal a heavily cratered surface and transmitted reams of surprising data that invalidates many of the theories about the sun's nearest and smallest planet.

"The thing that surprised me most," says Bruce Murray of the California Institute of Technology, leader of the huge team analyzing Mariner's photos of Mercury, "is that it looks just like the moon." Yet the planet is too dense to be like the moon through and through, one of the



Mercury's "bright spot" turned out to be this crater within a crater. Astronomers propose naming it for the late planetologist Gerard P. Kuiper.

few earth-based estimates that Mariner confirmed. The spacecraft precisely pinned down the ratio of the sun's mass to that of Mercury as 6,023,600 to 1 (recent earth-based calculations have contained uncertainties as great as 50,000 to 1).

"If it were really like the moon in terms of the mare flows and the whole business that goes with that," says Murray, "that's a chemical statement . . . that is very inconsistent with the bulk density of Mercury." But in fact Mercury seems to embody just such an inconsistency: a lightweight, moonlike surface enclosing a heavy, earth-style center. Says Murray, "It could easily have a large iron core." Finding out just how much of the planet is core will take weeks or months of computer analysis of the subtlest changes in the spacecraft's path. The resemblances to earth's moon, on the other hand, are readily apparent. The entire surface is pocked with crater upon crater, like the bleak highlands of the moon. Some are young enough perhaps tens of millions of years that dust or the darkening effects of the solar wind have not had a chance to hide the light-colored rays left by material blasted outward during the craters' formation. But the exciting ones are the old craters. Murray believes they may be relics of the planet's origin, well

over 4 billion years ago, since there are traces of no planet-wide events since then that could have covered them up. There are a few piled up cliffs, or scarps, but none of the vast fissures or mountain ranges that characterize the past of the moon.

Yet there is more to the lunar resemblance, including vast smooth areas like the maria and level-floored craters filled in by some still-not-identified process. This fine material, in fact, may be Mercury's most moon-like part, blanketing the planet in a remarkably even layer perhaps a few centimeters deep with "almost no exposed rocks." So says David Morrison of the University of Hawaii, whose readings of infrared emissions suggest a surface layer with moonishly low thermal conductivity, the same high porosity and other similar features. An astronaut walking on Mercury; he says, would leave footprints very much like those on the moon.

One of the jobs of Morrison's experiment was to measure the planet's widely ranging surface temperatures. daytime readings, measurable from earth, get as high as 800 degrees F., depending on Mercury's distance from the sun. A Mercurian night, however, is 88 days long, giving the surface plenty of time to cool off. As Mariner 10 crossed the planet's terminator, or twilight zone, the temperature fell from about 370 degrees above zero to 200 degrees below zero in only a few hundred kilometers on the surface, then kept on dropping to about 280 below. This gives Mercury a temperature range of more than 1,000 degrees F., by far, says Morrison, the widest in the solar system.

A major surprise was the discovery that the supposedly airless world has an atmosphere. Harvard astronomer Edward Reeves has privately reported signs of one in

data from Skylab, recorded when Mercury passed in front of the sun, but the idea seemed so unlikely that he is said to have been discouraged from publishing his findings. The atmosphere is extremely thin, less than one hundred-billionth as dense as earth's, says Michael B. McElroy, also of Harvard, but is indisputably there. The major element is helium, measured out to as far as about 300 miles from the planet, possibly delivered by the solar wind. Another source may be the decay of radioactive materials within the planet. This, according to McElroy, could mean that Mercury has as much uranium and thorium in its crust as does earth.

Other gases include argon, another decay product, neon from the solar wind, and possibly xenon. Conspicuously absent, except for a possible trace near the surface, was hydrogen, which was earlier reported as "extensive" by Soviet astronomer Nikolai Kozyrev.

The most significant discovery about the atmosphere, says A. Lyle Broadfoot of Kitt Peak National Observatory, was the existence of a helium "tail," streaming out from Mercury in a direction away from the sun. It was significant because shaping the tail was another unexpected Mercury feature, a magnetic field.

Norman Ness of NASA's Goddard Space Flight Center was another who expected the planet to have, at least to his magnetometers, a lunar look. It didn't. "It has turned out that Mercury is not at all like the moon." About 20 minutes before the spacecraft reached its closest distance to Mercury (about 466 miles), there were very clear signs of a bow shock, a shock front formed by the solar wind ricocheting off the planet's enveloping magnetic field, of which the moon has little or none.

Mercury's magnetic field, it seems, is not completely enveloping. It is so weak-as little as a thousandth as strong as earth's-that the minute push of the solar wind perhaps does not even Jet the field lines close on the side away from the sun. This would mean that trapped charged particles stream continuously off into space, and that the surprisingly abundant high energy electrons reported by University of Chicago's John Simpson must be continuously replenished by some mysteriously potent source.

Another mystery is the source of the magnetic field, since the slow rotation of Mercury virtually eliminates the dynamo theory. "The sweeping of interplanetary field lines past the planet," suggests Ness, "may generate an electrical current flow in the planet, and/or a possible weak ionosphere, then generates the magnetic field observed."

The ionosphere, sought directly by H. Taylor Howard of Stanford did not appear in the earliest analysis of Mariner's data. But the same analysis failed to detect the atmosphere, which is a million times too thin for it, so an extremely weak ionosphere has not been ruled out.

A burst of excitement was generated at the possibility of what would have been one of Mariner's major accomplishments: the discovery of a moon of Mercury. The signs, sudden brightening of the ultraviolet emissions recorded by Broadfoot's spectrometer, appeared repeatedly to the accompaniment of growing excitement. The culprit, however, after checks and counterchecks, seemed at last to have been a star, lined up against phenomenal odds to look in repeated observations as though it were a captured orbiting object.

With flawless—if occasionally misleading—data pouring in from the spacecraft, it came as a shock when engineers at the Jet Propulsion Laboratory in Pasadena discovered that the spacecraft was having some problems. About 30 hours after Mariner 10 passed its point of closest approach to Mercury, one of its two solar panels suddenly began drawing excess power, and the temperature in one equipment compartment shot up about 30 degrees. No data were lost, no experiment suffered, but the heat continued to rush upward, possibly from a short circuit. As the heat rose, optimism fell about the spacecraft's chances of surviving until September when it is scheduled to come around again for its second meeting with Mercury.



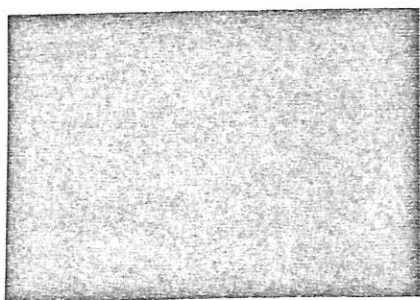
Mariner view of Mercury's southwest quadrant four hours before closest approach.

April 6, 1974

SUMMARY OF ASTROPHOTOGRAPHY RESULTS FOR THE FIRST QUARTER OF 1974

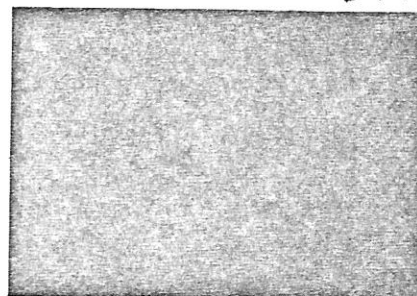
THIS SECTION OF THE WASP CONTAINS ASTROPHOTOGRAPHS MADE BY CLUB MEMBERS DURING JANUARY, FEBRUARY AND MARCH OF 1974. A SPECIAL PANEL SCREENED THE THOUSANDS OF PHOTOS THAT WERE TAKEN DURING THIS PERIOD, AND, AFTER MUCH DELIBERATION, SELECTED THE 14 FINEST PHOTOS. I WOULD LIKE TO THANK THE PANEL FOR THEIR TIME AND EFFORT.

D. HARRINGTON



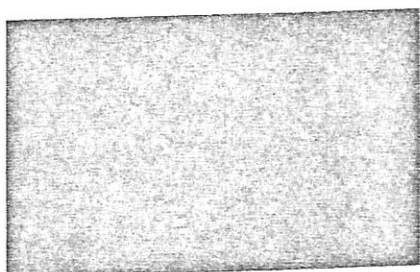
MILKY WAY ON TYPICAL
MICHIGAN EVENING

5 MINUTES ON GAF 200 (B. BOCK)
FEBRUARY 20, 1974



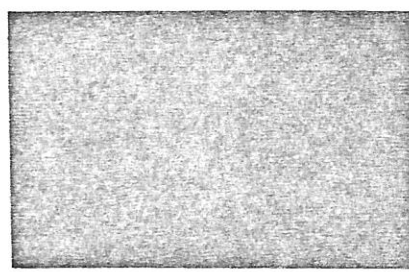
CLUSTER OF BLACK HOLES
IN PERSEUS

10 MINUTES ON H.S. EKTACHROME
(K. WILSON)



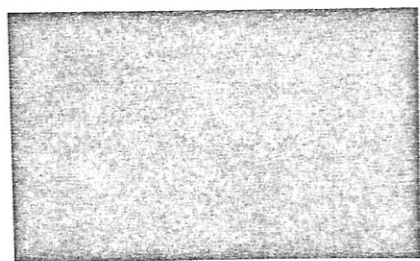
MERCURY AT INFERIOR CONJUNCTION

1 SEC. ON KODACHROME II
(D. MISSON)



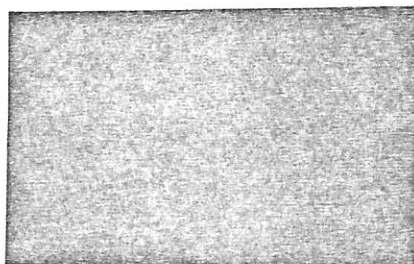
COMET KOHOUTEK AT MAXIMUM BRILLIANCE

5 MINUTES ON CHILLED TRI-X
(L. FAIX)



MOTION OF PLANET X DURING FEBRUARY

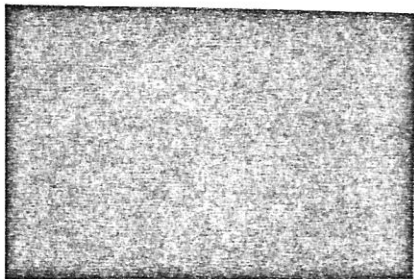
COMPOSITE 1 HOUR EXPOSURES
ON KODACHROME X
(J. PERSHA)



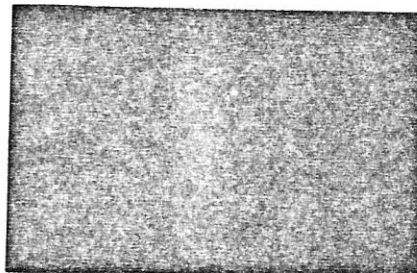
BOO X VIEW OF THE VERNAL EQUINOX

$\frac{1}{4}$ SECOND ON PLUS-X
(L. KALINOWSKI)

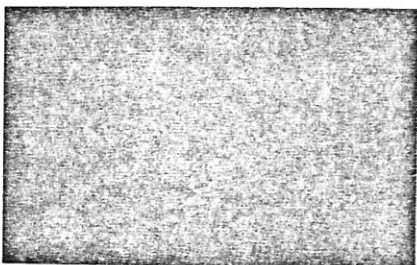
ASTROPHOTOS (CONTINUED)



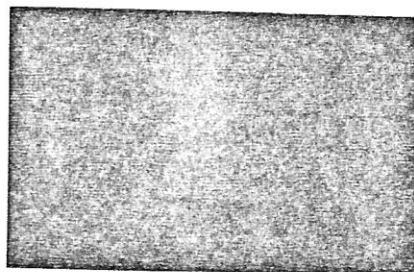
ENLARGEMENT OF CASSINI'S DIVISION
2 SECONDS ON EKTACHROME X
(D. HARRINGTON)



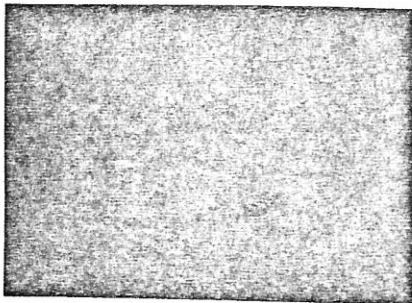
MARE ORIENTALIS AT FULL MOON
1/250 SECOND ON FOTICHRAME
(P. KWENTUS)



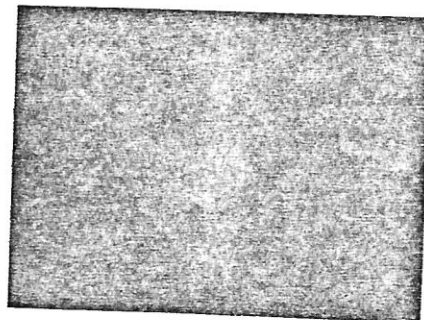
SIMULTANEOUS ECLIPSE OF IO AND
EUROPA BY THE SHADOW OF JUPITER
5 SECONDS ON H.S. EKTACHROME (PUSHED)
(R. CIVIC)



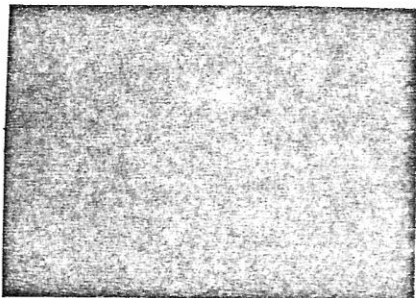
PHOBOS AND DEIMOS
6" REFLECTOR WITH 5" DIAGONAL
(D. BOCK)



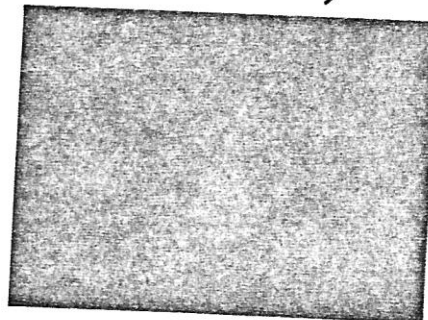
MARE CRISIUM ON LAST-QUARTER MOON
1/4 SECOND ON HIGH-CONTRAST COPY FILM
(T. SKONIENZNY)



SYZYG Y AT APHELION DURING
AN OPPOSITION OF THE SOLSTICE
(NEVER TO BE REPEATED)
(M. CHRISTENSEN)



PANORAMA FROM THE STRAIGHT
WALL TO ARISTARCHUS
(TWO-DAY OLD MOON)
(G. MORIN)



OCCULTATION OF PLUTO BY
THE NEW MOON
10 SECONDS ON GAF 500
(E. MCCULLOUGH)

U.S. NAVAL OBSERVATORY TOTAL OCCULTATION PREDICTIONS FOR 1974																										PAGE 29		OPTIONS -- 0.0,0.1	
COORDS., LOCATION, IDENT.-- W 82 55 25.4, +42 45 42.4, +0204M -- RAY CENTER, MICHIGAN-- WARREN AST.SOC 12.5-																													
DAY TIME-UT		P	AC	USNO	Q	MAX	SP	PCT	ELG	SN	MN	MN	CA	PA	VA	WA	LONG	LAT	A	B	C	DM	REF	NO	REF	NO	SAO		
H M S D		REF	NO	V	MAG			SNLT			AL	AL	AZ																
MAY																													
13/06	20 40/R	3	Z22229	62	9.3	G5	61-	102			5	115	59S	223	267	238	-1.4	-4.4	-0.8	2.4	0.1	-15	5793	163880	163880	163880	163880		
13/07	21 56/R	3	Z22270	64	9.1	F8	60-	102			15	126	77S	241	278	255	-1.5	-4.4	-1.1	1.9	-0.2	-15	5800	163904	163904	163904	163904		
13/07	18 52/R	3	Z22274	63	9.3	G0	60-	102			14	126	62S	226	265	241	-1.5	-4.4	-1.1	2.2	0.1	-15	5802	163907	163907	163907	163907		
13/08	41 13/R	4	Z22298	64	8.6	G5	60-	101			25	143	76N	268	295	283	-1.7	-4.4	-1.8	1.2	-0.6	-14	5864	163926	163926	163926	163926		
14/07	44 34/R	3	Z23179	65	8.9	K0	51-	91			15	120	87S	248	289	267	-2.8	-5.2	-0.9	1.8	-0.4	-10	5709	164501	164501	164501	164501		
14/08	44 04/R	2	3163	67	7.3	F0	50-	90			23	132	80S	241	275	259	-3.0	-5.2	-1.3	1.8	-0.1	-10	5714	164519	164519	164519	164519		
14/09	22 23/R	3	Z23223	64	9.0	F8	50-	90			-8	28	140	84N	258	286	276	-3.1	-5.2	-1.7	1.4	-0.4	-10	5717	164532	164532	164532	164532	
14/10	32 46/R	23	Z23273	81	8.3	K0	50-	90			3	35	159	2S	163	179	181	-3.3	-5.3	2.2	6.6	5.6	-10	5729	164565	164565	164565	164565	
14/13	46 55/D	2	3185	62	5.3	K0	49-	88			38	31	215	-86S	75	49	93	-4.0	-5.6	-1.6	-0.4	0.8	-09	5829	145637	145637	145637	145637	
14/15	01 18/R	2	3185	62	5.3	K0	49-	88			51	22	233	62S	223	186	241	-4.2	-5.7	-0.7	0.3	1.2	-09	5829	145637	145637	145637	145637	
16/07	16 37/R	2	Z24580	71	9.3	K5	32-	69			2	94	70S	229	276	252	-4.7	-5.9	-0.1	2.0	-0.1	-01	4389	146497	146497	146497	146497		
16/09	24 11/R	5	Z24619	88	7.3	F5	31-	68			-8	24	116	43N	296	338	319	-4.9	-6.0	-1.5	0.7	-1.8	-01	4394	146526	146526	146526	146526	
17/09	10 17/DA12		Z25243	95	9.4	K0	22-	56			-10	18	101	-1N	340	27	4	-5.4	-5.8	2.2	8.1	7.5	+03	4902	128464	128464	128464	128464	
17/09	18 31/RA12		Z25243	95	9.4	K0	22-	56			-8	20	103	14N	326	12	350	-5.4	-5.8	-3.4	-4.4	-8.2	+03	4902	128464	128464	128464	128464	
17/09	38 51/R	2	Z25251	85	9.0	G5	22-	56			-5	23	107	42S	201	246	225	-5.5	-5.8	-0.2	2.6	0.6	+03	4905	128474	128474	128474	128474	
18/08	54 24/R	3	Z00586	95	8.8	F5	14-	44			-12	10	88	36S	196	244	220	-5.6	-5.3	0.2	2.5	0.7	+07	0099	109398	109398	109398	109398	
18/09	23 24/R	2	Z00591	86	8.4	G5	14-	44			-7	16	92	83N	258	306	282	-5.6	-5.4	-0.3	1.6	-0.6	+08	0101	109403	109403	109403	109403	
19/08	37 41/R	2	Z01359	82	7.9	K0	8-	32			2	74	53S	217	263	239	-5.5	-4.5	0.4	1.9	0.1	+12	0189	092500	092500	092500	092500		
19/10	33 05/D	2	Z01443	81	7.1	A3	7-	31			4	22	92	-74N	59	108	81	-5.5	-4.5	-0.2	1.8	-0.3	+13	0250	092548	092548	092548	092548	
20/09	21 33/RA	1	Z02097	92	8.4	F5	3-	19			-7	4	70	82N	267	313	287	-5.0	-3.4	0.3	1.2	-0.6	+16	0294	092966	092966	092966	092966	
20/09	45 42/D	2	0371	92	6.4	G5	3-	19			-4	8	73	-33N	22	70	42	-4.9	-3.4	0.6	2.2	0.5	+17	0380	092983	092983	092983	092983	
20/10	21 08/R	2	0371	93	6.4	G5	3-	19			2	14	79	51N	299	348	318	-4.9	-3.4	-0.4	0.7	-1.3	+17	0380	092983	092983	092983	092983	
23/01	43 44/D	2	Z04133	95	7.0	B9	2+	16			-8	4	298	60N	56	11	64	-3.7	0.4	0.1	-0.4	1.1	+22	0825	076962	076962	076962	076962	
23/01	49 56/D	2	Z04139	92	8.6	F5	2+	16			-9	3	299	85N	81	37	09	-3.7	0.4	0.3	-0.9	0.7	+22	0829	076966	076966	076966	076966	
24/00	30 33/D	2	0922	81	8.2	K0	6+	29			3	26	277	57N	61	9	62	-2.4	1.9	-0.7	-0.5	1.2	+21	1116	077967	077967	077967	077967	
24/00	56 24/D	3	Z05460	81	8.0	B2	6+	29			-1	21	281	46N	50	359	51	-2.4	2.0	-0.8	-0.1	1.5	+21	1120	077990	077990	077990	077990	
24/01	12 04/D	2	Z05496	83	8.7	G5	6+	29			-3	18	283	61N	64	14	65	-2.4	2.0	-0.4	-0.7	1.1	+21	1127	078022	078022	078022	078022	
24/02	14 01/D	2	Z05573	76	7.6	B2	7+	30			3	8	292	77N	81	34	82	-2.3	2.2	0.1	-1.0	0.8	+21	1143	078074	078074	078074	078074	
24/02	53 09/D	2	Z05617	71	9.3	F5	7+	30			2	298	56S	129	85	130	-2.2	2.3	0.6	-1.5	0.1	+21	1154	078110	078110	078110	078110		
25/00	27 59/D	2	1084	51	7.3	K5	13+	43			4	35	264	79N	88	37	83	-0.9	3.6	-0.8	-1.2	0.7	+19	1623	096558	096558	096558	096558	
25/00	51 29/D	2	Z06989	51	8.6	K0	13+	43			0	31	268	57S	133	82	128	-0.9	3.7	-0.2	-2.1	0.1	+19	1625	096571	096571	096571	096571	
25/01	14 22/D	2	Z07003	63	8.9		13+	43			-4	27	272	46S	144	93	139	-0.9	3.7	0.1	-2.3	-0.1	+19	1632	096583	096583	096583	096583	
25/01	11 08/D	2	Z07008	59	0.0	K	13+	43			-3	28	271	79S	111	60	106	-0.9	3.7	-0.3	-1.6	0.4	+19	1634	096591	096591	096591	096591	
25/02	07 16/R	2	Z07008	59	0.0	K	13+	43			-11	17	281	-84N	286	236	280	-0.9	3.8	-0.0	-1.5	0.5	+19	1634	096591	096591	096591	096591	
25/01	10 55/D	2	Z07009	52	9.0	A0	13+	43			-3	28	271	83S	107	56	102	-0.9	3.7	-0.3	-1.6	0.5	+19	1635	096592	096592	096592	096592	
25/01	41 22/D	2	Z07032	55	9.0		14+	43			-8	22	276	87N	97	46	92	-0.9	3.8	-0.2	-1.4	0.6	+19	1644	096613	096613	096613	096613	
25/01	47 23/D	2	Z07033	55	9.4		14+	43			-9	21	277	67S	123	72	118	-0.9	3.8	0.0	-1.8	0.3	+19	1645	096615	096615	096615	096615	
25/02	29 53/D	2	Z07068	67	8.0	A0	14+	44				14	283	39S	152	103	147	-0.9	3.9	0.5	-2.2	-0.3	+19	1650	096635	096635	096635	096635	
25/02	27 32/D	2	Z07073	55	9.1		14+	44				14	283	71N	81	32	76	-0.8	3.9	-0.1	-1.1	0.8	+19	1652	096644	096644	096644	096644	
25/02	34 55/D	2	Z07075	55	9.0		14+	44				13	284	59S	132	83	127	-0.8	3.9	0.3	-1.8	0.1	+19	1653	096646	096646	096646	096646	

ASTRO-ALMANAC

By
Kenneth Wilson

MAY /

EVENT

1	
2	
3	
4	Mercury at superior conjunction at 12:00, Moon 5° S. of Uranus at 18:00.
5	Mercury at ascending node, max. η Aquarid meteors at 12:00.
6	Full Moon at 3:55.
7	
8	Moon 3° S. of Neptune at 1:00
9	
10	Mercury at perihelion, Twilight begins: 3:04-ends: 20:51 L.M.T.
11	
12	Lunar apogee (251,270 mi.) at 12:00.
13	
14	Last Quarter Moon at 4:29.
15	Mercury at 041422 48, Venus at 004502 53 (mag. -3.6), Mars at 070524 04 (mag. +1.8), Jupiter at 230107 22 (mag. -1.8), Uranus at 133208 58, Neptune at 162920 08.
16	Moon 7° N. of Jupiter at 2:00, W.A.S. General Meeting at 8:00 E.D.T.
17	Mercury 7° N. of Aldebaran at 5:00.
18	Moon 7° N. of Venus at 14:00.
19	Vesta stationary at 22:00.
20	Mercury at great. hel. lat. N., Venus at aphelion, Pallas stationary at 21:00, Twilight begins: 2:49-ends: 21:05 L.M.T.
21	New Moon at 15:34.
22	
23	Moon 2° S. of Mercury at 2:00 and 0.7° S. of Saturn at 23:00
24	Lunar Perigee (226,420 mi.) at 8:00.
25	Moon 4° S. of Mars at 5:00.
26	
27	
28	Mars at great. hel. lat. N., First Quarter Mon at 8:03.
29	Mars 5° S. of Pollux at 16:00, Neptune at opposition at 20:00.
30	Twilight begins: 2:37-ends: 21:19 L.M.T.
31	Moon 5° S. of Uranus at 23:00

NOTE: All times, unless otherwise noted, are in 24-hour E.S.T.