[redacted]

PROJECT 10073 RECORD CARD

1. DATE	2. LOCATION	12. CONCLUSIONS
22 Sep 60	Vicinity Winchester Bay, Oregon	☐ Was Balloon ☐ Probably Balloon ☐ Possibly Balloon
3. DATE-TIME GROUP Local _____ GMT 24/0530Z	4. TYPE OF OBSERVATION ☒ Ground-Visual ☐ Ground-Radar Binoculars ☐ Air-Visual ☐ Air-Intercept Radar	☐ Was Aircraft ☐ Probably Aircraft ☐ Possibly Aircraft
5. PHOTOS ☐ Yes ☒ No	6. SOURCE Military	☐ Was Astronomical ☐ Probably Astronomical Jupiter ☐ Possibly Astronomical
7. LENGTH OF OBSERVATION 3-4 min	8. NUMBER OF OBJECTS one	9. COURSE rapid ascent
		☐ Other _____ ☐ Insufficient Data for Evaluation ☐ Unknown

10. BRIEF SUMMARY OF SIGHTING

Spherical, moonsized object oscillating in a rapid ascent with all colors of the spectrum. Decreasing size.

11. COMMENTS

It is concluded that refraction of the planet Jupiter was responsible for this sighting. It is not unusual for refracted astronomical objects to give the illusion of zooming straight up. The description by the witness is characteristic of objects distorted by atmospheric refraction.

ATIC FORM 329 (REV 26 SEP 52)

ATIC FORM 329 (REV 26 SEP 52)

Translation Only
Source: American Meteor Society, Sky [illegible], p. 137

BOLIDE OF 1960 SEPTEMBER 20

A.M.S. No. 3573

P. F. BROGAN and C. P. OLIVIER

A relatively brilliant fireball passed over Oregon on this date at 8:00 p.m., P.S.T. Our regional director, P. F. Brogan of Bend, Oregon, made prompt efforts through the press to obtain reports and succeeded in obtaining 14 of varying value. Most reported the color as green or blue or white and 4 gave the duration averaging 3.5±1.0 sec. Two used the term "slow". The best estimate of its direction of motion is from 17° south of west (azimuth of radiant therefore 73°) to 17° north of east. From the reported observations it is impossible to determine the beginning point and hence length of path. However, the latter was certainly over 200 km long. The best sub-endpoint is about 10 km ESE of Fayette, Idaho, just across from the Oregon boundry. More exactly, its position is λ=116°53', φ=43°58', and the end height H2 is about 21 km. The object either exploded or had a considerable flareup near the end of its path. Preliminary plotting by Brogan greatly aided in the solution, and the collecting of the data is wholly due to his efforts. It is most regrettable that a better solution could not be derived; one or two good reports from Idaho would have permitted this.

No Case (Information Only)

21 September 1960
Kingston, Massachusetts

On this same date, 21 SEPTEMBER 1960 at Kingston, Massachusetts, a swiftly-maneuvering UFO was sighted, and shortly afterwards witnesses saw several aircraft move in, patrolling the area.

No Case (Information Only)

21 September 1960
Edmonton, Alberta, Canada

On September 21 at Edmonton, Alberta, Canada three witnesses watched a silvery disc-shaped UFO maneuver over the area. One witness stated: "The wierd thing was that we could see red and blue flames coming from it now and then."

24 - 30 SEPTEMBER 1960 SIGHTINGS

DATE	LOCATION	OBSERVER	EVALUATION
24	Thule AB, Greenland	Military	Astro (METEOR)
24	Point Arena, California	Military	Astro (METEOR)
24	Wethersfield, England	Military	Insufficient Data
24	Greenham Common, England	Military	Astro (METEOR)
24	Coos Bay, Oregon	[redacted]	Other (PARACHUTE)
24	Denver, Colorado		Aircraft
24	Columbus, Ohio		Astro (METEOR)
25	Windsor,Canada		Astro (METEOR)
25	S of Midway Island	Military Air	Astro (REFRAC ARCTURUS)
26	NE Bermuda	Military Air	Astro (METEOR)
26	Camp Irwin, California	Multi	Other (MISSILE)
26	Jean, Nevada	[redacted]	Astro (METEOR)
26	Italy	[redacted]HOTOS)	Other (HOAX)
26	Dhahran, Saudi Arabia	WX Observer	Astro (METEOR)
26	Silver Lake, Michigan	[redacted]	Aircraft
27	New Mexico Area	Multi	Astro (METEOR)
27	Janesville, Wisconsin	[redacted]	Aircraft
27	Aurora, Colorado	[redacted]	Insufficient Data
28	Kirksville AFS, Missouri	Military (RADAR)	Other (WEATHER)
28	Wichita Falls, Texas	Multi	Astro (METEOR)
28	Roswell, New Mexico	[redacted]	Astro (METEOR)
28	Agness, Oregon		Aircraft
28	Urbana, Illinois		Astro (METEOR)
28	Grand Junction, Colorado	Multi/[redacted]	Other (INVERSION)
28	29.32N 125W (Pacific)	Military	Aircraft
28,29	Okinawa	Multi	Astro (METEOR)
28-9 Oct	Douglasville, Georgia	[redacted]	Astro (STARS/PLANETS)
29	Wolfe City, Texas		Insufficient Data
29	Guam	Military RADAR	1. Other (ANOMALOUS PROP)
		Visual	2. Aircraft
29	Portland, Oregon	[redacted]	Insufficient Data
30	Boulder, Colorado		Astro (VEGA)
30	Kansas City, Missouri		Astro (VENUS)
30&28,31 Oct	Melrose, New Mexico	Multi/Military	Astro (STARS/PLANETS)

ADDITIONAL REPORTED SIGHTINGS (NOT CASES)

DATE	LOCATION	SOURCE	EVALUATION
25	Las Cruces, New Mexico & Texas Area	Newsclipping	
25	New Zealand, Venezuela	Newsclipping	

RECEIVED

26 SEP 60 15 29

ATIC

1960 SEP 26 [illegible] 50

WPAFB
ADMIN. SERVICES

[illegible] ASZC [illegible] 4EZCJYA347

[illegible] RJEDS[illegible]

[illegible] 35

ZNR

[illegible] 251811Z

[illegible] CCSD THIRTEEN

TO RJWFAL/COMAIRDEFCOM ENT AF BASE

RJEDS[illegible]/COM AIR INTELLIGENCE CEN WRIGHT PATTERSON AF BASE

RJEZHQ/ASSISTANT CHIEF OS STAFF INTELLIGENCE HQ USAF

RJEZHQ/OFC OF INFORMATION SEVICES HQ USAF

[illegible]CSD GRNC

[illegible]

UCLAS [illegible] UFO SIGHTING REPORT 25 AD FORM 121 MAR 59 [illegible] SUBPART I ONE

(1) SPHERICAL (2) [illegible] (3) OSCILLATORY INCLUDING ALL COLORS OF

THE SPECTRUM (4) ONE (5) N/A (6) LACK OF PROTRUSIONS (7) NO

(8) NO (9) INCREASING SIZE AND [illegible] RATE OF ASCENT [illegible] SUBPART II

[illegible] (1) [illegible] (2) 15 DEG [illegible] 085 [illegible] (3) 45 DEG

[illegible] (4) VERTICAL OSCILLATION (5) [illegible] VERTICAL CLIMB (6)

[illegible] SUBPART III ONE (1) VISUAL (2) [illegible] (3) [illegible]

[illegible] (1) [illegible] (2) [illegible]

[illegible]VER LOOKOUT TOWER CMM 43 DEG 4 [illegible] NORTH 124 DEG 15 MIN WEST [illegible]

SUBPART VI CMM (1) N/A (2) MR.IA ROBERT G 3 9- 42 [illegible] USCG CMM

PAGE TWO RUWPKJ 39

LOOKOUT CMM RELIABEL [illegible] SUBPART VII (1) GENERALLY GOOD CMM CLEAR AND

BRIGHT (2) SURFACE NONE (3) UNLIMITED (4) UNLIMITED (5) NONE (6) NONE

X SUBPART VIII NONE X SUBPART IX NEGATIVE X SUBPART X NONE NOTED

X SUBPART XI LTJG THOMAS P MARIAN 41534 USCGR OPS/EO CCGD13 CMM

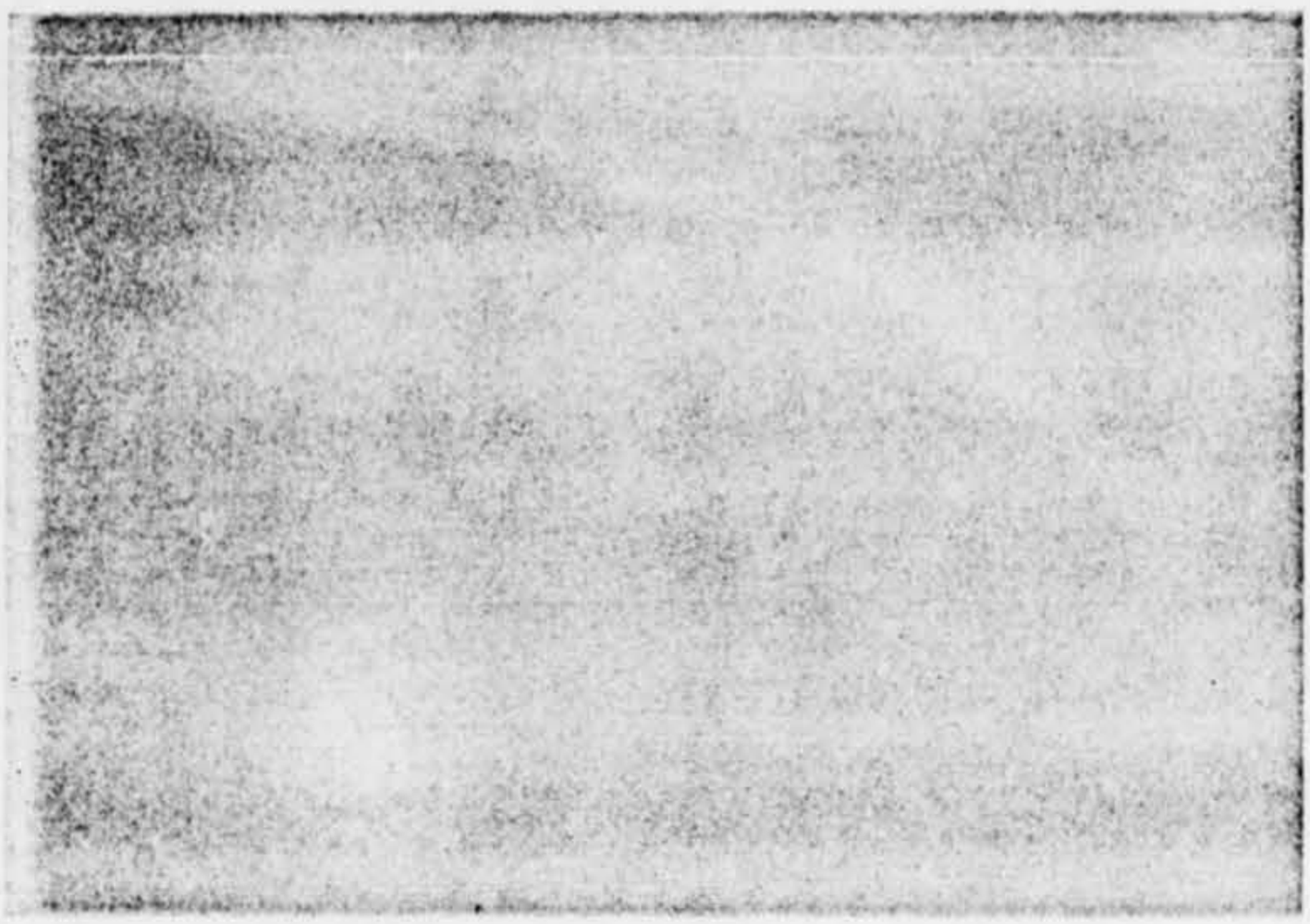
ADDL INFO OBTAINED VIA MSG AND PHONE CONVERSATION X SUBPART XII NONE

BT 26/1830Z

At 2:15 p.m. Eastern standard time on September 17, 1960, Edgar Everhart, Mansfield Center, Connecticut, photographed the rare antheiion or antisun (H in the diagram opposite). It occurred on the bright parhelic circle, and through it was an oblique cross, whose arms (I and J) made an angle of 120 degrees. Twenty degrees below the anthelion was what appeared to be another arc (K). All of the photographs with this article are reproduced from Kodachrome originals.

The Solar Halo Complex of September 17, 1960

EDGAR EVERHART, *University of Connecticut*



The noncircular solar halo is seen in this picture curving from top left to bottom right. The small ring around the sun is a lens-flare effect that occurred inside the camera.

LAST September 17th the skies over southern New England and Long Island were covered with circles, crosses, and arcs, some white and others brightly colored. These beautiful halo phenomena were caused by sunlight reflected and refracted by ice crystals high in the air.

Two of the most spectacular halo displays recorded in this country were seen on January 10, 1918, at Boulder, Colorado, and on March 8, 1920, at Ellendale, North Dakota. Descriptions of them can be found in W. J. Humphreys' *Physics of the Air* (1929). Last September's event was at least comparable to these famous cases, though all three differed from each other.

The commonest feature of halo dis-

experiment has five detectors: 1. A 7-30-micron sensor to measure the infrared radiation of the earth and its atmosphere combined. 2. A more sensitive 8-12-micron unit for a "window" where the cloudless atmosphere is transparent. This device will give temperatures of cloud tops or of the earth's surface, depending on local weather conditions. 3. A monitor for a narrow band near 6.3 microns, where water vapor radiates energy.

4. A wide-band unit covers the spectrum from the ultraviolet to the near infrared, 0.2 to five microns, to measure the earth's albedo. 5. A photocell sensitive in the visible region from 0.5 to 0.7 micron provides data to correlate the other four sensor readings with the television pictures. This is needed because the cameras are set parallel to the spin axis of the satellite, while the sensors are canted 45 degrees to the axis, so the rotation will cause them to sweep strips of the earth below them.

The second radiation experiment has two sensors: one white, the other black. These measure the heat balance of the earth's area that is scanned by the wide-angle camera. Surface observations from at least 15 nations are to be correlated with the pictures and other information from the satellite.

An important new method of controlling the orientation of the spin axis is being tested with Tiros II. Surrounding its base is a coil of aluminum wire that can be energized by ground command, thus making the satellite act as a magnet. Its interaction with the earth's magnetic field will produce a torque causing the body to precess. In addition, there are five pairs of small spin rockets. On the third day in orbit, two sets were fired to increase the spin rate of Tiros II from about eight to 13.9 revolutions per minute.

The chief ground stations maintaining contact with this satellite are at Ft. Monmouth, New Jersey, and San Nicolas Island, California. Besides the three-watt transmitter, this Tiros has two 235.0-megacycle units for the television cameras and two low-power tracking beacons operating at frequencies of 108.00 and 108.03 megacycles.

In addition to the payload and its final rocket stage, two more parts, designated #3 and #4, are being followed by Space Track. Possibly these are the weighted cables used for reducing spin after orbit was attained.

The inclination of the orbits of all of these is about 48.6 degrees to the plane of the earth's equator. They had initial periods of revolution from node to node of 98.19, 98.14, 98.17, and 98.32 minutes, for #1, #2, #3, and #4, respectively. The first of these, the Tiros II satellite package itself, had perigee and apogee heights initially amounting to about 380 and 463 miles.

Discoverer XVII

MAJOR IMPROVEMENTS in space technology were tested for the first time with the Discoverer XVII launching from Vandenberg Air Force Base in California on November 12, 1960, at 20:42:33 Universal time. This was called "the most successful operation in the Discoverer series" by the U. S. Air Force Ballistic Missile Division, following the airplane recovery of the re-entry capsule after more than two days in space.

The orbiting vehicle was an enlarged, improved rocket. The Agena B, 25 feet long and weighing 15,500 pounds, is more than six feet longer and 7,000 pounds heavier than the Agena A. The most important advance was its new engine, which permits doubling the burning time. In the earlier model, the thrust nozzle was plugged to sustain sea-level pressure until combustion began, but in the new design an initial squirt of oxidizer into the chamber provides the needed pressure for spontaneous ignition of the fuel. This firing method permits a second start in space when necessary.

Special attention was given to stabilizing the Agena vehicle, with apparent success. When the Discoverer XVII capsule was released on the 31st revolution, it descended in plain view of four C-119 airplanes, one of which snatched it in midair. More elaborate equipment now permits complete control over initiating the Discoverer recovery sequence, instead of relying on preset programs as previous Discoverers had.

Fortuitously, Discoverer XVII was launched soon after a very intense solar flare had erupted, so the experimental material in the 300-pound capsule was subjected to some exceptionally heavy radiation. Biological specimens included a preparation of the human protein gamma globulin, cultures of human tissues, mold spores, and algae. A radiation dosimeter and a pack of photographic emulsions for recording nuclear particles also were aboard.

The Agena continues to travel in an orbit inclined 81.86 degrees to the earth's equator. Known as 1960$_2$, its initial period was 96.5 minutes, with perigee and apogee heights of 115 and 618 miles.

Sputnik VI

ANOTHER animal-carrying spaceship was placed in orbit by the Soviet Union, according to Russian press reports of last December 1st. The cabin was similar to the one successfully retrieved on August 20, 1960 (see Sky and Telescope for October, page 201, and November, page 274).

Like Sputnik V, the vehicle carried two dogs and other animals and plants. It weighed 4,563 kilograms, a little more than five tons. Its initial period was 88.6 minutes in an orbit inclined 65 degrees to the equator, according to Soviet scientists.

Space Track figures give initial perigee and apogee heights of only 116 and 160 miles, respectively, for Sputnik VI (1960$_2$1) with similar values for its launching rocket (1960$_2$2). Several hours after Space Track announced that the former was no longer in orbit, Soviet sources confirmed that an attempt had been made to recover the cabin on December 2nd, during its 18th revolution, but that it had burned up on re-entry. The rocket also entered the atmosphere either that day or early on December 3rd.

MARSHALL MELIN
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DIAMETER OF VENUS

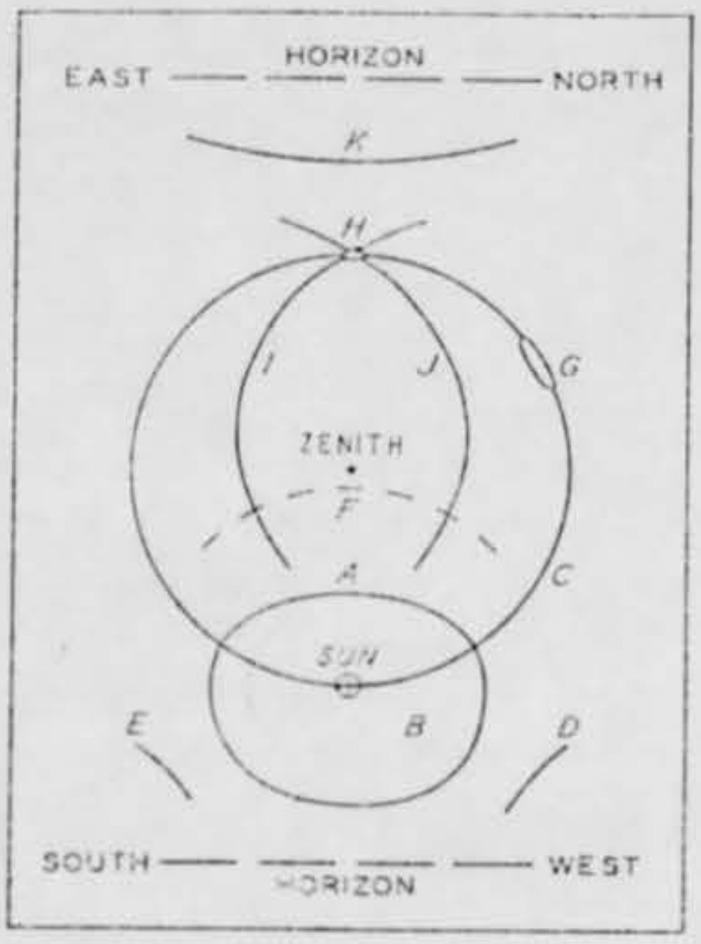
The precise size of the planet Venus has long been somewhat uncertain, for measurements of its disk with ordinary micrometers are subject to many kinds of systematic error. Moreover, all direct optical determinations of the diameter refer not to the solid surface of the planet, but to the heavy layer of clouds enshrouding it. A new and much more reliable result has now been derived from visual, photographic, and photoelectric observations of the occultation of Regulus by Venus on July 7, 1959 (see page 483 of Sky and Telescope for July, 1959, and page 606, September, 1959).

The data from two dozen observatories in the Eastern Hemisphere were used by G. de Vaucouleurs and D. H. Menzel of Harvard Observatory, who report their results to the British journal *Nature*.

As the planet passed in front of the star, the latter disappeared and reappeared gradually — because of differential refraction of its light by Venus' atmosphere. The Harvard astronomers chose for the duration of the occultation the interval between times of half brightness. This gave a value of 12,330 kilometers for the diameter of an atmospheric shell some 65 kilometers above the planet's clouds. For the solid globe of Venus, if the cloud top is 27 kilometers above the surface, as the temperature data suggest, the diameter is 12,146 kilometers (7,547 miles), with an uncertainty of about 12 kilometers. This is 0.952 the mean diameter of the earth, and differs little from the best previous data.

CORRECTION

On page 329 of the December, 1960, issue, the number of solar flares that had been catalogued up to the end of 1956 is given as 438. This figure, however, refers only to flares of importance 2+ or greater; it does not include the more numerous lesser events of importance 1 and 2. H. L. Bondy, Flushing, New York, quotes M. Waldmeier as saying that 927 flares were observed from 1935 to 1944.



The author here identifies the features mentioned in this article, the sun being 34 degrees high, at 2:15 p.m. EST.

plays is a ring of 22 degrees radius around the sun or moon. This ring is colored red on the inside, changing to yellow and then white on the outer edge. It is caused by refraction of light through hexagonal needlelike ice crystals which sometimes occur in thin cirrus clouds. Associated phenomena, although less common, are sundogs or parhelia, 22 to 30 degrees to the right and left of the sun, and vertical sun pillars. The recent event did not have these patterns, but did show several rare, almost unique, features.

At 2:00 p.m. Eastern standard time I was alerted to the halo complex by Wilbur Widmer, and proceeded to photograph and sketch it. Kodachrome film was used with a Miranda camera having a wide-angle Travegon lens of 35-mm. focus. The exposures were 1/60 second, at f/11 toward the sun and at f/8 away from it. The color transparencies show more detail than noticed visually, and also allow angular measurements to be made.

The most prominent feature was the ring around the sun, labeled **A** in my sketch. It was not circular, nor was the sun centered vertically within it. Its top was 22 degrees from the sun, the right and left sides 30 degrees, and the bottom 28. From inside out, its colors were red, yellow, and white. In the sketch, ring **A** is drawn from the photographs and from visual observations by Mr. Widmer, Felix Yokel, Donald Richardson, Elizabeth Everhart, and myself. The first two of these had watched the display for several hours, and reported that the ring was circular at first, becoming distorted as the day progressed.

The peculiar shape of ring **A** was the most novel feature of the display, since it is not mentioned either in Humphreys' book or in M. Minnaert's *The Nature of Light and Colour in the Open Air* (1954). They refer to the *circumscribed halo* formed by upper and lower tangent arcs to the 22-degree halo, and this has a horizontal extent varying with the altitude of the sun. But a circumscribed halo should pass 22 degrees above and below the sun, and this does not agree with the observations of ring **A**.

In the original negative of the lower picture opposite, there is an indistinct boundary of 22-degree radius outside of which the sky is brighter. This appears on several other transparencies, and was also seen by Mr. Richardson. Marked **B** in the drawing, it is possibly a trace of the 22-degree halo.

The white parhelic circle, **C**, passed through the sun and extended completely around the sky, parallel to the horizon. It is caused by reflection from the vertical faces of ice crystals. Bows **D** and **E** are so-called infralateral tangent arcs to the halo of 46 degrees, caused by refraction from ice crystals with horizontal axes. They were brightly colored with red nearest the sun, followed by yellow, green, and white in that order. Though the 46-degree halo itself was missing when the photographs were taken, a faintly colored arc of it, **F**, was seen briefly a few hours earlier by Mr. Yokel, John Landry, and G. Lauria.

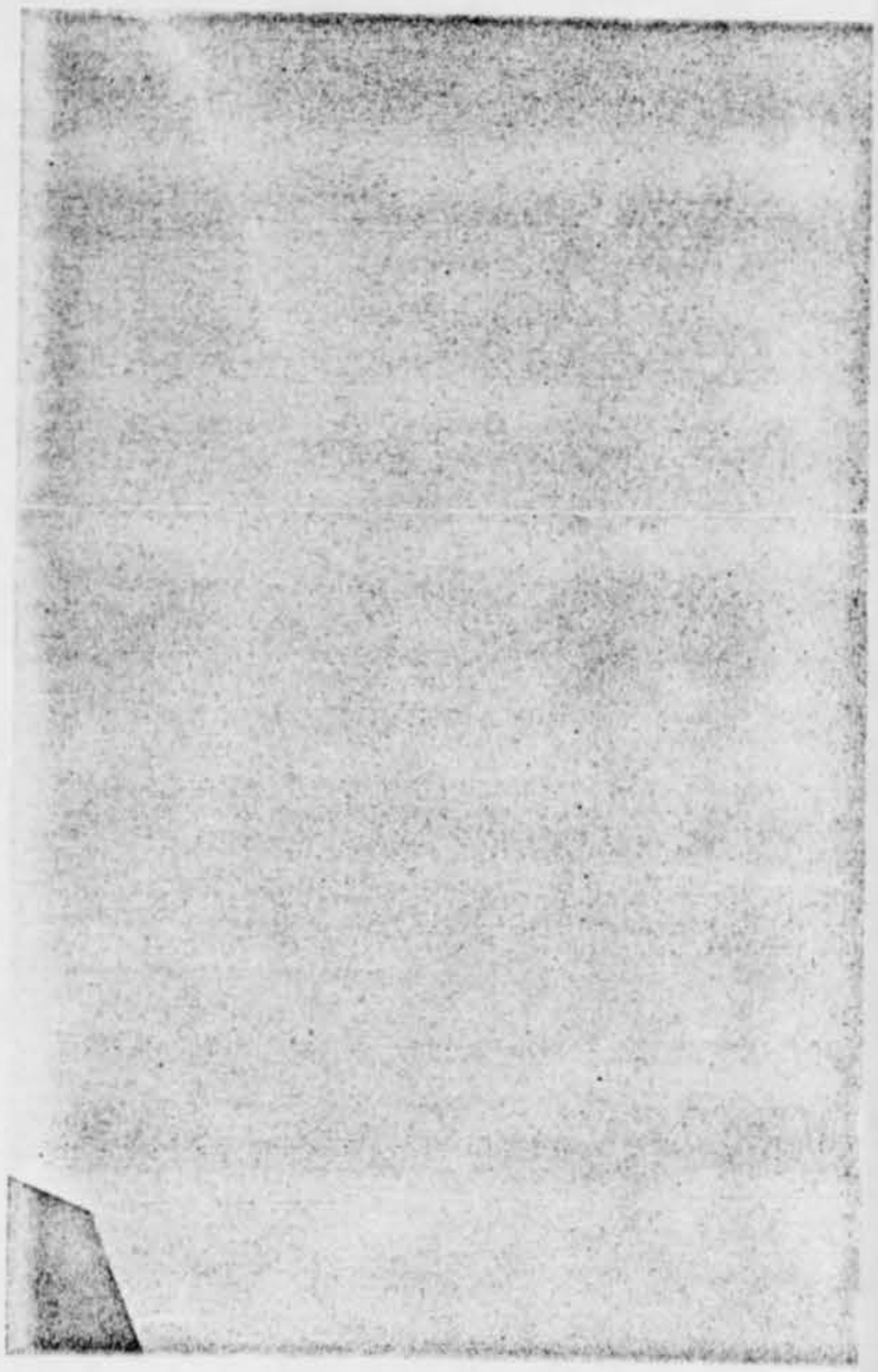
Another photograph showed a bright region **G**, 14 degrees long, centered on the parhelic circle about 120 degrees from the sun. This may have been an elongated and diffuse parhelion of 120 degrees, but was not observed visually.

The very rare anthelion or countersun appeared at **H**, opposite the sun on the parhelic circle. It was centered on a spectacular St. Andrew's cross, white against the blue sky, lasting only 15 minutes. Oblique arcs **I** and **J**, forming the cross, stretched symmetrically across the sky on either side of the zenith, nearly to ring **A**. Visually, it did not seem that they would pass, if extended, through the sun, nor did they approach **A** tangentially.

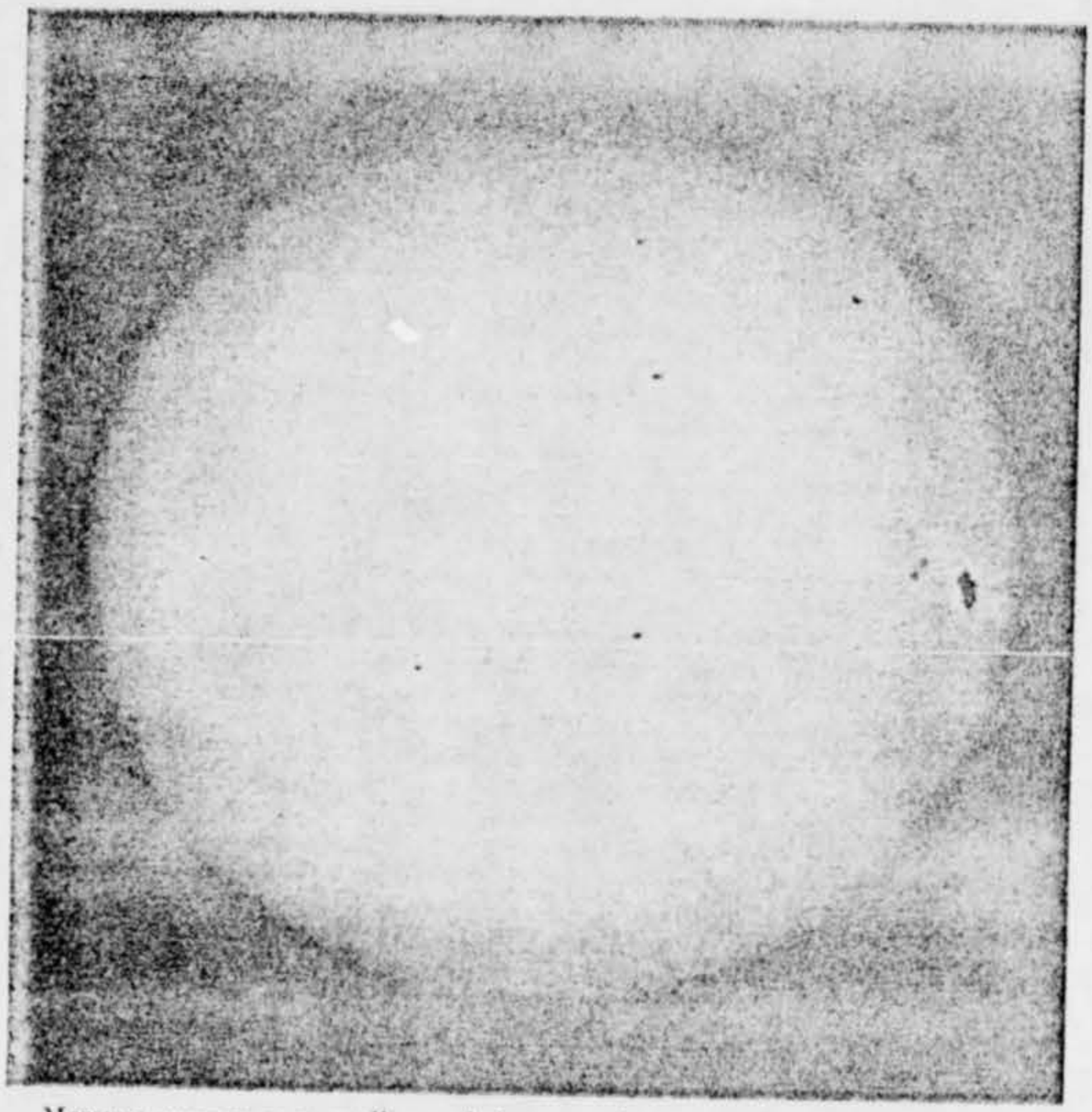
About 20 degrees below the anthelion, halfway to the horizon, was a white arc **K**. It arched slightly downward to the northwest horizon, and apparently was not centered on the antisolar point below the horizon. I have not seen any printed reference to such a feature, which may not have been a halo.

At 2:30 p.m., the entire complex suddenly faded, and the sky quickly became covered with tufts of altocumulus clouds.

ED. NOTE: Herbert A. Luft, Oakland Gardens, New York, also reported this display (see page 29).



Mr. Everhart's many photographs of the September 17th halo phenomena included this one of the intersection of the noncircular arc (upper left) with the horizontal parhelic circle (above center), while part of a tangent arc shows in the lower right. The sun is to the left (out of the picture). The side of the tangent arc D nearest it was bright red, and looked like a rainbow except that there was no blue, this color being replaced by white. The smallest distance from the arc to the sun was measured by the author as 45 degrees, plus or minus two degrees. This value agrees well with the 46 degrees expected.



Mercury appears as a small round dot near the top of the sun's disk, a half inch inside the solar outline. William C. Atkinson, New York City, took this half-second exposure on Kodak Autopositive film at 15:36:03 Universal time. His instrument was a 4½-inch Newtonian reflector. The large sunspot at the right was nearly central during the great November aurora (see page 37).

Findings from Mercury's Transit

JOSEPH ASHBROOK

TELESCOPES across half the world viewed and photographed Mercury's passage in front of the sun's disk on November 7, 1960. Reports have been received by SKY AND TELESCOPE of observations made in western Europe, North and South America, and as far across the Pacific as Australia.

Many correspondents had devoted particular attention to timing the contacts, the four stages of the transit when the disk of Mercury is tangent to the solar disk. Their numerous observations are tabulated here, affording rich material for analysis.

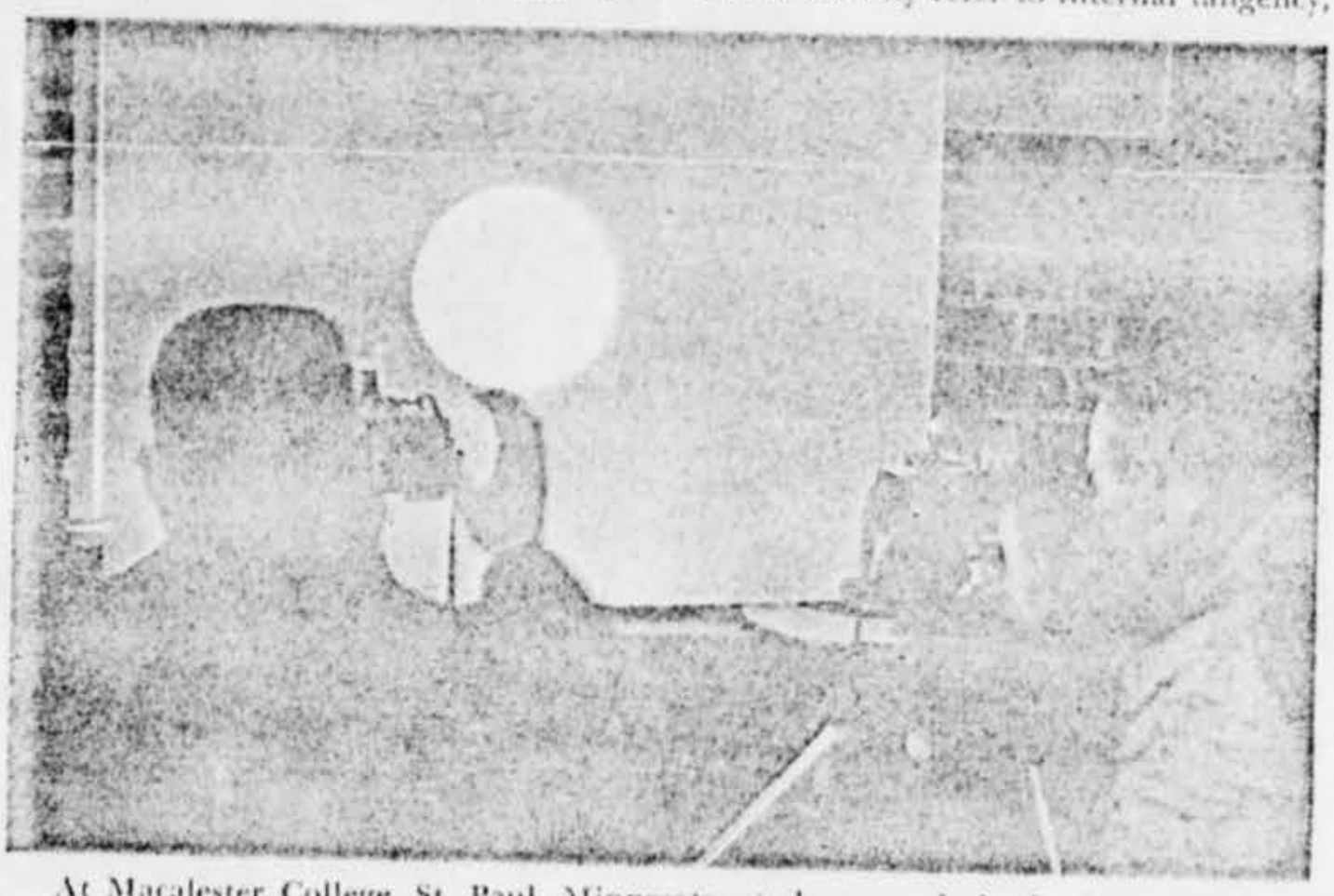
Strictly speaking, contact I is an unobservable event with ordinary telescopes, being the moment when Mercury is externally tangent to the sun. The first recognition of a visible notch in the sun's edge is necessarily later, by an unpredictable amount. At several previous transits, however, spectroscopic equipment has been used to show Mercury in silhouette against the solar chromosphere just before first contact, allowing a useful timing of this event.

Listed here are 188 timings of the other contacts, expressed as Universal times. For each, the predicted time for the observer's location has been computed from the approximate formulae on page 306 of the *American Ephemeris* for 1960. (In using those equations, the conversion from Ephemeris to Universal time has been taken as −35 seconds.) Lastly, for each observation, the difference between the observed and the computed times is given under the heading $O - C$.

A number of observations, some of excellent quality, were received too late for inclusion in this analysis. A few very discordant results were omitted; the times may have been incorrectly transcribed. All timings listed are believed to have been made with the aid of WWV or CHU radio time signals, or their equivalent.

The large table gives the observers' locations in order of longitude. Limitations of space do not permit naming of timekeepers and assistants, even though they played a vital part in the success of the program. Also, certain reports from groups listed only averages and not each individual's timings.

For contact II, there are 50 observations. Few correspondents mention having observed the black drop, the dark ligament sometimes seen connecting Mercury to the sun's edge for a brief interval at this stage. The bulk of these observations evidently refer to internal tangency,



At Macalester College, St. Paul, Minnesota, students used the horizontal telescope arrangement shown on the front cover to obtain a large projected image of the sun, allowing astronomy instructor Sherman Schultz, Jr., to demonstrate the November transit to over 200 persons.

No Case (Information Only)

17 September 1960
New Berlin, Wisconsin

[redacted]