

No. 41 GEOGRAPHIC COORDINATES OF THE CATALINA STATION

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ABSTRACT

The geographic coordinates of the observatory on the Catalina Mountains are obtained by reference to the geodetic marker on nearby Mt. Bigelow.

The Catalina Station of the Lunar and Planetary Laboratory occupies two adjacent sites, I and II. Figure 1 shows their approximate locations with respect to the Catalina Highway to Mt. Lemmon, which is the summit of the Santa Catalina Mountains at 9185 ft (2800 m). Sites I and II were selected as being 10 miles closer to the University by road (36 mi) and burdened with less snow in winter than Mt. Lemmon. At present the 21-inch telescope is located on Site I (the prospective location of the 60-inch telescope), while the 28-inch telescope is located on Site II, with various other instruments to follow later.

Because no geodetically-determined points were visible from reflector locations at either Site I or Site II, their locations could not be found by triangulation. However, a marker is located on Mt. Bigelow, about 0.2 mi north of the Palisades Ranger Station (see Fig. 1) and within a mile of Site I. According to information received from the U.S. Coast and Geodetic Survey in Washington, the coordinates of the brass tablet marked "Bigelow 1937" are: west longitude $110^{\circ}42'49''.483$, north latitude $32^{\circ}24'55''.438$, elevation 8550 ft.

In order to connect the stations with this reference point, a Bausch & Lomb theodolite with rod and tape were used to survey a polygonic line along the road to Mt. Bigelow. Pegs were put down about

200 ft apart along the side of the road. The theodolite set-up between the pegs was used to read the azimuths and elevations, while the distances were measured with a steel tape rather than by the stadia arrangement. Azimuth and elevation could be read to 1 minute of arc. The direction of the instrument's magnetic needle could be read to 0.10 of a degree. Whenever possible, the differences in elevation were read to 0.01 ft on the rod, but many parts of the road were so steep that it was necessary to use the vertical circle.

Before the survey, the deviation of the needle from the meridian was determined by observing Polaris on 1963 October 7. This procedure took place from a point at west longitude $7^{\text{h}}23^{\text{m}}6$ and north latitude $32^{\circ}7'$. The azimuth of Polaris was computed by means of the tables in *The American Ephemeris* as a function of the local sidereal time.

The work was started October 8 from Mt. Bigelow, and went down to peg 15. On October 9 the surveying was continued to peg 32. On October 10 the measures were first extended to peg 37, at a point where the road splits off to Site II of the 28-inch dome. Then the measures were started from Site II, going down from peg 60 to 71 and connecting the latter with peg 37. A half day more was spent October 11 connecting peg 37 with the location of

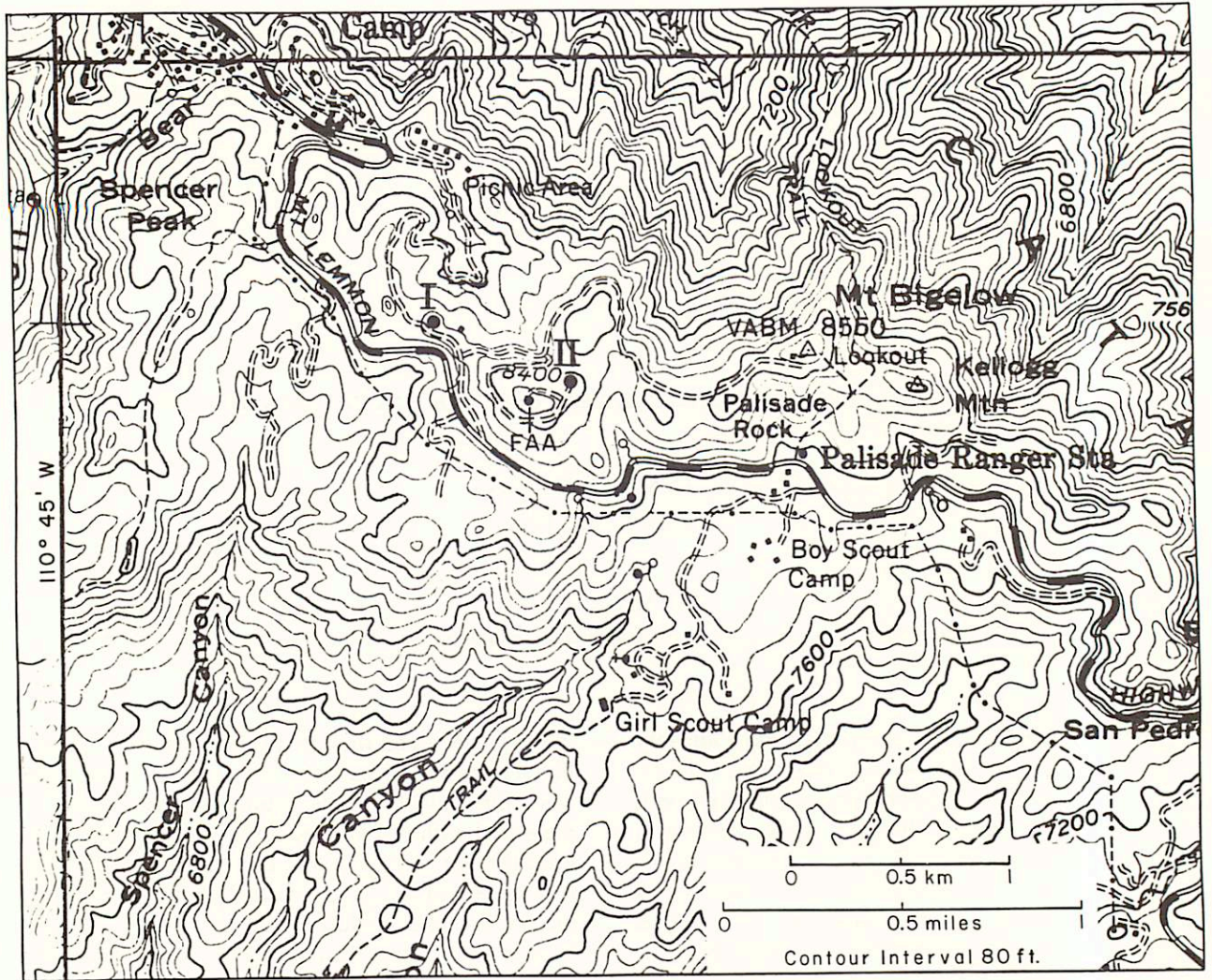


Fig. 1. Map of Catalina Station area with Sites I and II marked.

TABLE 1
DEVIATION OF THE MAGNETIC NEEDLE*
1963 OCT. 7

U.T.	L.S.T.	AZIMUTH POLARIS	NEEDLE READING	DEVIATION
3h 2m	20h34m6	+1°1	13.0	14°1
4 49	22 24 . 9	+0.9	13.1	14.0
11 48	5 26 . 0	-0.8	14.8	14.0

*The figure of 14°0 was adopted for the deviation.

TABLE 2
MT. BIGELOW CONNECTED WITH SITE I

PEG	STEP (feet)			SUMMATION (feet)		
	West	North	Elevation	West	North	Elevation
1-Marker	+ 76.57	- 34.23	-14.32	+ 76.57	- 34.23	- 14.32
2- 1	-142.07	+ 8.39	- 9.69	- 65.50	- 25.84	- 24.01
3- 2	- 39.76	+169.52	- 6.87	- 155.26	+ 143.68	30.88
4- 3	+ 46.34	+136.22	-15.19	- 108.92	+ 279.90	46.07
5- 4	+ 90.39	+ 99.78	-13.66	- 18.53	+ 379.68	59.73
6- 5	+ 91.15	-104.78	-16.51	+ 72.62	+ 274.90	76.24
7- 6	+138.28	- 48.05	-16.57	+ 210.90	+ 226.85	92.81
8- 7	+128.30	- 75.68	-14.80	339.20	+ 151.17	107.61
9- 8	+ 43.86	-137.38	-14.29	383.06	+ 13.79	121.90
10- 9	+139.33	- 75.70	-12.84	522.39	- 61.91	134.74
11-10	+144.16	-103.66	-11.48	666.55	- 165.57	146.22
12-11	+ 34.35	-143.12	-12.09	700.90	308.69	158.31
13-12	+ 44.26	-131.07	- 6.25	745.16	439.76	164.56
14-13	+ 30.00	-100.95	- 5.08	775.16	540.71	169.64
15-14	+114.91	- 94.89	- 1.72	890.07	635.60	171.36
16-15	+130.47	-149.92	- 2.15	1020.54	785.52	173.51
17-16	+177.90	- 78.99	- 5.03	1198.44	864.51	178.54
18-17	+179.14	- 84.05	- 8.55	1377.58	948.56	187.09
19-18	+198.62	- 7.25	- 0.78	1576.20	955.81	187.87
20-19	+188.21	- 35.69	- 6.54	1764.41	991.50	194.41
21-20	+196.81	- 24.72	- 1.49	1961.22	1016.22	195.90
22-21	+187.23	- 42.91	-16.76	2148.45	1059.13	212.66
23-22	+164.40	-112.12	-14.63	2312.85	1171.26	227.29
24-23	+157.68	-121.89	- 3.71	2470.53	1293.15	231.00
25-24	+164.95	-112.61	+ 0.39	2635.48	1405.76	230.61
26-25	+108.24	-163.44	+26.05	2743.72	1569.20	204.56
27-26	+ 10.14	-191.86	+13.10	2753.86	1761.06	191.46
28-27	+ 97.41	-159.23	+14.15	2851.27	1920.29	177.31
29-28	+126.48	-155.47	+15.57	2977.75	2075.76	161.74
30-29	- 36.98	-171.80	- 9.82	2940.77	2247.56	171.56
31-30	-155.69	-115.87	-13.97	2785.13	2363.43	185.53
32-31	-195.64	+ 14.08	-12.86	2589.49	2349.35	198.39
33-32	- 95.32	-166.47	- 2.47	2494.17	2515.82	200.86
34-33	- 5.36	-189.85	- 1.43	2488.81	2705.67	202.29
35-34	+ 34.32	-195.29	- 9.58	2523.13	2900.96	211.87
36-35	+ 36.90	-195.93	-11.45	2560.03	3096.89	223.32
37-36	- 12.79	-198.20	-11.67	2547.24	3295.09	234.99
38-37	- 63.14	-161.51	-18.62	2484.10	3456.60	253.61
39-38	+194.06	- 34.08	-21.15	2678.16	3490.68	274.76
40-39	+188.33	- 65.57	-14.03	2866.49	3556.25	288.84
41-40	+198.43	- 12.28	-12.00	3064.92	3568.53	300.84
42-41	+192.58	+ 36.09	-11.98	3257.50	3532.44	312.82
43-42	+194.80	+ 41.12	- 7.71	3452.30	3573.56	320.53
44-43	+196.33	- 32.62	-15.65	3648.63	3606.18	336.18
45-44	+194.82	- 33.57	- 8.31	3843.45	3639.75	344.49
46-45	+192.28	+ 50.24	- 0.82	4035.73	3689.99	345.31
47-46	-142.74	+137.92	+26.09	3892.99	3552.07	319.22
Site I-47	+ 91.39	+ 72.31	- 0.34	+3984.38	-3474.76	-319.56

TABLE 3
SITE II CONNECTED WITH PEG 37

PEG	STEP (feet)			SUMMATION (feet)		
	West	North	Elevation	West	North	Elevation
Site II	0.00	0.00	0.00	+ 538.47	-2737.52	-106.88
60-Site II	+148.57	-132.14	+ 7.99	687.04	2869.66	98.89
61-60	+133.70	-139.74	+ 8.10	820.94	3009.40	90.79
62-61	- 86.52	-197.46	- 6.47	794.42	3206.86	97.26
63-62	+203.74	+ 13.18	- 8.32	998.16	3193.68	105.58
64-63	+200.31	- 14.87	- 9.51	1198.47	3208.55	115.09
65-64	+159.35	-124.36	- 8.70	1357.82	3332.91	123.79
66-65	+144.06	-138.88	-11.28	1501.88	3471.79	135.07
67-66	+122.01	-158.63	-12.31	1623.89	3630.42	147.38
68-67	+ 97.26	+ 91.15	-10.16	1721.15	3539.27	157.54
69-67	+191.32	+ 35.45	-11.78	1912.97	3503.82	169.32
70-69	+199.26	- 2.10	-10.52	2112.25	3505.92	179.84
71-70	+191.35	+ 30.73	-17.46	2308.58	3475.19	197.30
37-71	+243.66	+180.10	-37.69	+2547.24	-3295.09	-234.99

TABLE 4
REDUCTION TO GEOGRAPHIC COORDINATES

	MAGNETIC DIFFERENTIAL COORD.			GEOGRAPHIC DIFFERENTIAL COORD.			
	West	North	Elevation	Feet		Arc	
Site I	+3984.38	-3479.76	-319.56	+4718.62	-2412.51	+55°04	-23'87
Site II	+ 538.47	-2737.52	-106.88	+1184.74	-2525.95	+13.82	-25.99

TABLE 5
FINAL VALUES OF GEOGRAPHIC COORDINATES

	LONGITUDES		LATITUDES	ELEVATIONS	
	Arc	Time		Feet	Meters
Base of 60-in. reflector*	110°43'44".5	7h22m54s.97	+32°24'31".6	8230	2509
Base of 28-in. reflector	110 43 3.3	7 22 52.22	24 30 . 4	8443	2573

*Since the center of the 60-in. reflector is 27 ft above the ground level, its altitude is 8257 ft, or 2517 m.

the 60-inch dome. In Table 2 the successive steps between Mt. Bigelow and Site I are listed in feet with the coordinates referred to the magnetic meridian. In the right-hand columns the summations are given.

The corresponding figures for the run between Site II and peg 37 are presented in Table 3, but here the summations were carried backward starting from the values for peg 37 in Table 2.

The differential magnetic coordinates were next reduced to geographic coordinates by a rotation of 14°0 and are shown in Table 4.

Applying these differences to the initially mentioned position of Mt. Bigelow, we obtain the final values in Table 5.

Taking into account the uncertainties of the method, we estimate that the above quantities are determined within 0".5. The topography of the road is illustrated by Figure 2.

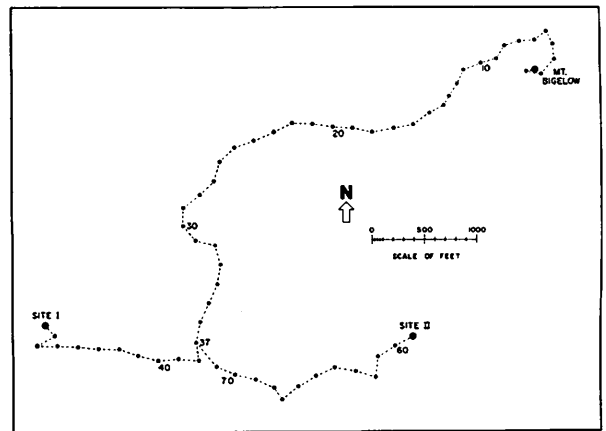


Fig. 2. Topography of the road.

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