No. 128 RELATIVE ALTITUDES FROM THREE YERKES PHOTOGRAPHS

by D. W. G. ARTHUR
December 1, 1966

ABSTRACT

Results are presented for comparator measures for relative lunar altitudes on three Yerkes lunar photographs.

1. Introduction

In *Comm. LPL* No. 127, I presented a complete method for the determination of lunar relative altitudes from shadow measurements on photographs obtained with the 61-in. reflector of LPL's Catalina Station.

This paper, however, deals with some earlier measures on three Yerkes lunar photographs. In these the selenographic positions were estimated from the grids of the Orthographic Atlas of the Moon (Arthur and Whitaker, 1960 and 1961). Thus, as will be noted in the tables of results, the selenographic coordinates (ξ, η) of the peaks are given to either 0.001 or 0.0005 of the moon's radius.

2. The Measures

The measures were made by H. Connors with LPL's Mann 422-Comparator. The photograph was oriented with the direction of the projected shadows parallel to the *x*-axis of the comparator and the

x-readings were recorded for each end of the shadow; the ξ and η of the peak were noted at the same time. Thus the data recorded for each peak were the ξ and η of the peak and the shadow length in milimeters. This last was found as the difference of the two *x*-readings.

3. The First Reductions

The reductions were performed twice. In the first reduction formulas (5), (13), (21), and (41) of *Comm. LPL* No. 127 were used to derive the first relative altitude for each peak. The second reduction formulas will be given below.

4. The Systematic Errors

Comparison of the computed relative altitude h with the classical value, as listed by Schmidt (1878), showed strong discrepancies with both systematic and random characteristics. The random components arise from errors in both the classical and photographic measures, from the uneven nature of the

surface on which the shadow falls, and from errors in the identifications. From a careful examination of the photographs, some identifications were judged to be uncertain and were rejected. Others were rejected later for statistical reasons, as indicated below.

Although the systematic behavior of the discrepancy

$$\delta h = h \text{ (photo)} - h \text{ (Schmidt)}$$

is somewhat masked by the random effects, it is clear that δh is smallest near the terminator and that it becomes larger as we pass into the illuminated zone where the shadows are shorter. The simplest hypothesis is that the measured shadow lengths are all in error by the same amount. Let the corresponding constant amount in χ be $\delta \chi$. From equation (21) of *Comm. LPL* No. 127,

$$\frac{\partial h}{\partial \chi} = \sin \phi - \chi \cos \phi,$$

and hence, with sufficient precision,

$$\delta \chi = \delta h \Big/ \frac{\partial h}{\partial \chi}$$

$$= \delta h / (\sin \phi - \chi \cos \phi). \tag{1}$$

The value of $\delta \chi$, as derived from the points common to my measures and the catalog of Schmidt, shows considerable dispersion, as already noted. The simple mean was accepted and all values deviating from this by more than three times the standard deviation were rejected. The final mean was computed with the surviving values. The origin of the systematic height error δh is of some interest, and the approximate form of this, as arising from a constant χ error, certainly suggests some form of photographic effect. However, circumstances prevented me from following the matter further and I had to be satisfied with the heuristic treatment outlined above, which at least appears to bring the photographic altitudes into line with the classical values. Schrutka-Rechtenstamm (1955) previously noted a similar effect in connection with height measures on the plates of the Paris photographic atlas. The effect appears to be absent from the Manchester work (Kopal *et al.* 1961), but still may be related to the tip and peak effects of Fielder (see Kopal *et al.* 1961). The effect appears also to be absent from the photographs obtained with the 61-in. Catalina reflector, which have larger scales and better controlled exposures than the Yerkes plates.

It is interesting to examine the magnitude of $\delta \chi$. In units of the moon's radius, the mean values are:

+0.000 003	±0.00050	for Yerkes 774,
+0.000 897	±0.00025	for Yerkes 1254,
+0.000 790	±0.00016	for Yerkes 1269.

For Yerkes 1254 and 1269, for which the effect is large and well determined, the constant error in χ appears to be on the order of 0.0008 of the moon's radius, that is, about 70 microns on the photograph, or 0.9 miles in nature. This is appreciably larger than the random errors of the measures.

If a systematic height error due to approximately constant χ errors is the real explanation of the differences between the classical values and those obtained here, then there are certain perils in the small-format technique used at Manchester (Kopal *et al.* 1961). It is easy to see that if the measures are based on small-field photographs, always exposed in the same way with similar angles of solar illumination, the resulting altitudes may be consistent, yet still be affected by systematic error. It is fair to add that there is little evidence of these photographic effects in the published Manchester results.

5. The Second Reductions

After the determination of a mean value of $\delta \chi$, each χ was replaced by $\chi - \delta \chi$, and the relative altitude h was calculated again.

6. Special Treatment of Small Craters

Measures of the internal shadows of small craters are of interest only when they lead to the real depth of the crater, so they should be made when the tips of the shadows are near the centers of the craters. Thus, for areas not too far from the central meridian, the photographs were scanned for small craters with the tips of their shadows near the centers. In these cases it is advantageous to compute with the (ξ, η) position of the lower end of the shadow, rather than that of the peak, for the former coincides with the center of the crater and is more easily interpreted from the grids of the Orthographic Atlas. For craters that are standard points, the required positions can be taken directly from position catalogs.

The use of the solar altitude ϕ computed for the lower end of the shadow (instead of the upper, as usual) requires modification of equation (21) of *Comm. LPL* No. 127. As it happens, the modification is very simple and amounts only to a reversal of the sign of the curvature term. Hence, the modified

form of (21) is

$$h = \chi \sin \phi + \tfrac{1}{2} \chi^2 \cos^2 \phi. \qquad (2)$$

7. Description of Results

The results are given in Tables 1–5. Tables 1, 3 and 4 give the results of measurements reduced by

$$h = \chi \sin \phi - \tfrac{1}{2} \chi^2 \cos^2 \phi.$$

The first two columns give the position of the peak, while the last two give the position of the lower end of the shadow. The first height and adjusted height are given in kilometers.

Tables 2 and 5 give the position of the peak, the solar elevation at the tip of the shadow, the ad-justed shadow and the crude and adjusted heights.

REFERENCES

Kopal, Z., *et al.* 1961, Studies in Lunar Topography G.R.D. Research Notes No. 67; AFCRL-852.

Schrutka-Rechtenstamm, G. 1955, "Relative Hohen-bestimmungen auf dem Monde mittels des Pariser Mondatlasses und visueller Messungen am Fernrohr." Mitteilungen der Universitäts-Sternwarte, Wien, 7, No. 11.

Schmidt, J. F. J. 1878, *Charte der Gebirge des Mondes,* Berlin.

YERKES PHOTOGRAPH No. 744 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
1	+.2570	+.0665	.0577	.007928	0.74	0.74	+.2492	+.0664
2	+.2565	+.0680	.0572	.006107	0.58	0.58	+.2505	+.0679
3	+.2570	+.0710	.0578	.006847	0.65	0.65	+.2503	+.0709
4	+.3275	+.0460	.1305	.004474	1.00	1.00	+.3231	+.0459
6	+.3255	+.0170	.1276	.003828	0.84	0.84	+.3218	+.0169
7	+.3460	+.0800	.1510	.004991	1.29	1.29	+.3411	+.0799
8	+.3720	+.1060	.1795	.004685	1.75	1.75	+.3664	+.1059
9	+.3710	+.2020	.1835	.005955	1.87	1.87	+.3652	+.2019
10	+.3690	+.1120	.1766	.006613	1.99	1.99	+.3625	+.1119
11	+.2910	+.3700	.1131	.006496	1.24	1.24	+.2846	+.3699
12	+.2130	+.7710	.1012	.020223	3.21	3.20	+.1932	+.7706
13	+.2085	+.7775	.0983	.023483	3.54	3.54	+.1855	+.7771
14	+.2120	+.7585	.0967	.021186	3.18	3.18	+.1913	+.7581
15	+.2095	+.7650	.0959	.015798	2.42	2.42	+.1940	+.7647
16	+.1620	+.7700	.0478	.012951	0.93	0.93	+.1493	+.7698
17	+.1660	+.7665	.0510	.017327	1.28	1.28	+.1490	+.7662
18	+.2190	+.8260	.1244	.007447	1.56	1.56	+.2117	+.8259
19	+.1450	+.8920	.0717	.015775	1.75	1.75	+.1296	+.8917
20	+.1560	+.8590	.0698	.010015	1.13	1.13	+.1462	+.8588
21	+.1430	+.8665	.0591	.016678	1.47	1.47	+.1267	+.8662
22	+.3140	-.0320	.1148	.020808	3.78	3.78	+.2936	-.0324
23	+.3130	-.0400	.1136	.015203	2.81	2.80	+.2981	-.0403
24	+.2680	-.0430	.0668	.006096	0.68	0.68	+.2620	-.0431
25	+.2760	-.0735	.0749	.017294	1.99	1.99	+.2591	-.0738
26	+.2550	-.0715	.0532	.039021	2.29	2.29	+.2168	-.0722
27	+.2950	-.0950	.0946	.012195	1.88	1.88	+.2831	-.0952
28	+.2790	-.1000	.0780	.013734	1.70	1.70	+.2656	-.1003
29	+.2770	-.0940	.0759	.002500	0.32	0.32	+.2746	-.0940
30	+.2775	-.0970	.0764	.007095	0.90	0.90	+.2706	-.0971
31	+.3300	-.0950	.1313	.008235	1.82	1.82	+.3219	-.0952
32	+.3187	-.0950	.1194	.007142	1.44	1.44	+.3117	-.0951
33	+.3305	-.1400	.1321	.012231	2.68	2.68	+.3185	-.1402
34	+.3480	-.1850	.1513	.007578	1.94	1.94	+.3406	-.1851
35	+.3300	-.1980	.1326	.008013	1.79	1.79	+.3222	-.1981
36	+.3215	-.2830	.1267	.011998	2.52	2.52	+.3098	-.2832
37	+.3240	-.2800	.1292	.012574	2.69	2.69	+.3117	-.2802
38	+.3125	-.2725	.1168	.011140	2.16	2.15	+.3016	-.2727
39	+.3240	-.3835	.1351	.009990	2.26	2.26	+.3142	-.3837
40	+.3235	-.3875	.1349	.010002	2.26	2.26	+.3137	-.3877
41	+.3175	-.3710	.1274	.005911	1.28	1.28	+.3117	-.3711
42	+.2900	-.3990	.1005	.002595	0.45	0.45	+.2875	-.3990
43	+.2895	-.3935	.0996	.023029	3.53	3.53	+.2670	-.3939
44	+.2910	-.4070	.1022	.020172	3.23	3.23	+.2712	-.4074
45	+.2840	-.4150	.0955	.017527	2.64	2.64	+.2668	-.4153
46	+.2695	-.4060	.0797	.004994	0.67	0.67	+.2646	-.4061
47	+.2590	-.4070	.0688	.006898	0.78	0.78	+.2522	-.4071
48	+.2490	-.4100	.0587	.005781	0.56	0.56	+.2433	-.4101
49	+.2553	-.3900	.0637	.004511	0.48	0.48	+.2509	-.3901
50	+.2580	-.3780	.0657	.007580	0.82	0.82	+.2506	-.3781
51	+.2740	-.3610	.0812	.006898	0.93	0.93	+.2672	-.3611

Yerkes Photograph No. 744 Normal Measurements

Point	ξ	η	Sin ϕ	$\chi - \Delta\chi$	Height	Adjusted Height	ξ_T	η_T
52	+.2930	-.3690	.1016	.018877	3.03	3.03	+.2745	-.3693
53	+.3120	-.3620	.1210	.006028	1.24	1.24	+.3061	-.3621
54	+.2360	-.4060	.0449	.012330	0.83	0.83	+.2239	-.4062
55	+.3415	-.4230	.1567	.007193	1.92	1.92	+.3345	-.4231
56	+.3370	-.4350	.1530	.006347	1.65	1.65	+.3308	-.4351
57	+.3420	-.4690	.1614	.000976	1.70	1.70	+.3360	-.4691
58	+.3100	-.4950	.1301	.008159	1.79	1.79	+.3020	-.4951
59	+.2870	-.4870	.1051	.005030	0.90	0.90	+.2821	-.4871
60	+.3005	-.5105	.1218	.005842	1.21	1.21	+.2948	-.5106
61	+.3700	-.5325	.1984	.007737	2.62	2.62	+.3624	-.5326
62	+.3440	-.5265	.1698	.008019	2.31	2.31	+.3361	-.5266
63	+.2300	-.5880	.0574	.017053	1.45	1.45	+.2133	-.5883
64	+.2320	-.5760	.0579	.016241	1.41	1.41	+.2161	-.5763
65	+.2720	-.5810	.1004	.006490	1.10	1.10	+.2656	-.5811
66	+.2510	-.6240	.0845	.012115	1.65	1.65	+.2391	-.6242
67	+.2500	-.6300	.0844	.007680	1.08	1.08	+.2425	-.6301
68	+.2500	-.6200	.0829	.014491	1.91	1.91	+.2358	-.6203
69	+.2850	-.6140	.1188	.007279	1.46	1.46	+.2779	-.6141
70	+.2820	-.6080	.1147	.010785	2.05	2.05	+.2714	-.6082
71	+.2810	-.6200	.1155	.006903	1.35	1.34	+.2742	-.6201
72	+.2970	-.5600	.1240	.009395	1.95	1.95	+.2878	-.5602
73	+.2750	-.5700	.1021	.006678	1.15	1.15	+.2685	-.5701
74	+.2665	-.7040	.1148	.010307	1.97	1.97	+.2564	-.7042
75	+.2620	-.6970	.1086	.007364	1.34	1.34	+.2548	-.6971
76	+.2580	-.7560	.1170	.007743	1.52	1.52	+.2504	-.7561
77	+.2725	-.7560	.1325	.006001	1.35	1.35	+.2666	-.7561
78	+.2295	-.7575	.0871	.005377	0.79	0.79	+.2242	-.7576
79	+.2230	-.7440	.0772	.020597	2.40	2.40	+.2028	-.7444
80	+.2240	-.7780	.0862	.015197	2.08	2.08	+.2091	-.7783
81	+.2220	-.7820	.0851	.019801	2.59	2.59	+.2026	-.7824
82	+.2260	-.7760	.0879	.021389	2.87	2.87	+.2051	-.7764
83	+.2270	-.7740	.0884	.020659	2.81	2.81	+.2068	-.7744
84	+.2270	-.7730	.0882	.022072	2.96	2.96	+.2054	-.7734
85	+.2195	-.7960	.0861	.015104	2.06	2.06	+.2047	-.7963
86	+.2570	-.8170	.1322	.008912	1.98	1.98	+.2483	-.8172
87	+.2270	-.8160	.0997	.008123	1.35	1.35	+.2190	-.8161
88	+.2140	-.8320	.0907	.010338	1.54	1.54	+.2039	-.8322
89	+.2160	-.8260	.0910	.006522	0.99	0.99	+.2096	-.8261
90	+.1960	-.8160	.0669	.006073	0.67	0.67	+.1901	-.8161
91	+.1640	-.8280	.0369	.006992	0.41	0.41	+.1572	-.8281
92	+.1960	-.8570	.0797	.010823	1.40	1.40	+.1854	-.8572
93	+.2300	-.8750	.1229	.008315	1.72	1.72	+.2219	-.8752
94	+.1930	-.9270	.1069	.029302	4.71	4.71	+.1643	-.9275
95	+.1990	-.9220	.1107	.025517	4.35	4.35	+.1740	-.9225
96	+.1990	-.9180	.1086	.028722	4.71	4.71	+.1709	-.9185
97	+.1510	-.9210	.0583	.008896	0.83	0.83	+.1423	-.9212
98	+.1410	-.9310	.0528	.005690	0.49	0.49	+.1354	-.9311
99	+.3760	-.6180	.2171	.005622	2.10	2.10	+.3705	-.6181
100	+.3785	-.5850	.2147	.005538	2.04	2.04	+.3731	-.5851
101	+.3720	-.4790	.1945	.003643	1.22	1.22	+.3684	-.4791

YERKES PHOTOGRAPH NO. 744 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
102	+.4110	-.5130	.2405	.008372·	3.44	3.44	+.4028	-.5132
103	+.4000	-.2900	.2103	.005863	2.12	2.13	+.3943	-.2901
104	+.5070	+.0365	.3228	.003994	2.23	2.23	+.5031	+.0364
105	+.4285	+.2950	.2521	.004087	1.78	1.78	+.4245	+.2949
106	+.4350	+.5460	.2910	.004525	2.27	2.27	+.4306	+.5459
107	+.4310	+.5550	.2881	.003596	1.79	1.79	+.4275	+.5549
109	+.3450	+.7030	.2248	.006726	2.59	2.59	+.3384	+.7029
110	+.2310	+.7600	.1171	.004633	0.93	0.92	+.2265	+.7599
111	+.2780	+.8825	.2116	.005779	2.10	2.10	+.2723	+.8824
112	+.2250	+.3020	.0383	.010655	0.61	0.61	+.2146	+.3018
114	+.2510	+.1940	.0573	.014556	1.27	1.27	+.2367	+.1937
115	+.2500	+.1960	.0564	.008587	0.78	0.78	+.2416	+.1958
116	+.2480	+.2010	.0547	.015014	1.23	1.23	+.2333	+.2007
117	+.2885	+.1620	.0944	.004392	0.70	0.70	+.2842	+.1619
118	+.2780	+.1720	.0840	.017529	2.30	2.30	+.2608	+.1717
119	+.2730	+.1780	.0792	.006989	0.92	0.92	+.2662	+.1779
120	+.2730	+.1130	.0760	.010842	1.33	1.33	+.2624	+.1128
121	+.2560	+.1130	.0584	.004427	0.43	0.43	+.2517	+.1129
122	+.2665	+.1025	.0688	.003005	0.35	0.35	+.2636	+.1024
123	+.2525	-.0040	.0513	.011218	0.89	0.89	+.2415	-.0042
124	+.2300	+.0060	.0283	.011418	0.45	0.45	+.2188	-.0058
125	+.2440	-.3140	.0474	.013879	0.98	0.98	+.2304	-.3143

YERKES PHOTOGRAPH NO. 744 SMALL CRATERS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT
1	+.1804	-.8451	.0593	.004072	0.43	0.43
2	+.1298	-.8416	.0055	.005132	0.07	0.07
3	+.2220	-.8574	.1077	.005157	0.99	0.99
4	+.2461	-.8597	.1346	.004332	1.03	1.03
5	+.2609	-.8297	.1404	.004980	1.49	1.49
6	+.2570	-.8237	.1342	.004743	1.13	1.13
7	+.2570	-.7950	.1258	.005826	1.30	1.30
8	+.2428	-.8038	.1131	.004625	0.93	0.93
9	+.2873	-.7387	.1443	.004906	1.25	1.25
10	+.2841	-.7532	.1443	.005248	1.34	1.34
11	+.2700	-.7240	.1226	.004847	1.05	1.05
12	+.2536	-.7269	.1058	.003493	0.65	0.65
13	+.2426	-.7312	.0951	.005435	0.92	0.92
14	+.2570	-.7170	.1073	.005341	1.02	1.02
15	+.2374	-.7089	.0850	.004316	0.65	0.65
16	+.2070	-.7589	.0638	.005742	0.67	0.67
17	+.2339	-.6564	.0718	.017070	2.38	2.38
18	+.2320	-.7640	.0913	.003293	0.53	0.53
19	+.2398	-.7671	.1003	.003129	0.55	0.55
20	+.2959	-.6746	.1405	.004292	1.06	1.06
21	+.2653	-.6926	.1113	.004281	0.84	0.84
22	+.2790	-.6801	.1235	.002821	0.61	0.61
23	+.2472	-.6838	.0905	.002963	0.47	0.47
24	+.3244	-.6513	.1668	.003527	1.03	1.03

(CONTINUED)

YERKES PHOTOGRAPH NO. 744 SMALL CRATERS (CONTINUED)

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT
25	+.3330	-.6523	.1763	.003445	1.07	1.07
26	+.3243	-.6229	.1620	.003103	0.88	0.88
27	+.3220	-.5772	.1528	.002761	0.74	0.74
28	+.3219	-.5692	.1516	.003455	0.92	0.92
29	+.3187	-.5637	.1475	.003173	0.82	0.82
30	+.3030	-.5820	.1332	.004655	1.10	1.10
31	+.3060	-.5870	.1371	.004138	1.00	1.00
32	+.3080	-.5910	.1398	.003597	0.89	0.89
33	+.2840	-.5890	.1141	.003950	0.80	0.80
34	+.2411	-.5454	.0636	.003467	0.39	0.39
35	+.2310	-.5600	.0549	.003137	0.31	0.31
36	+.3056	-.4594	.1220	.003854	0.83	0.83
37	+.3380	-.4680	.1571	.005959	1.66	1.66
38	+.3760	-.4870	.1996	.003020	1.06	1.06
39	+.3680	-.3873	.1821	.003136	1.00	1.00
40	+.3566	-.3453	.1671	.004523	1.33	1.33
41	+.3607	-.3617	.1725	.002254	0.68	0.68
42	+.4277	-.3207	.2418	.004100	1.74	1.74
43	+.4370	-.3230	.2520	.004912	2.17	2.17
44	+.3397	-.2426	.1442	.003500	0.89	0.89
45	+.3348	-.2409	.1390	.002888	0.71	0.70
46	+.2742	-.2504	.0759	.005474	0.75	0.75
47	+.2570	-.2092	.0568	.005415	0.56	0.56
48	+.2456	-.1818	.0444	.003041	0.24	0.24
49	+.3094	-.1064	.1097	.003146	0.61	0.61
50	+.3220	-.0169	.1240	.003793	0.83	0.83
51	+.2830	-.0170	.0827	.004803	0.71	0.71
52	+.3210	+.0640	.1242	.002382	0.52	0.52
53	+.2965	+.0795	.0991	.003569	0.63	0.63
54	+.3547	+.0602	.1595	.001889	0.53	0.53
55	+.3355	+.2476	.1490	.003229	0.85	0.85
56	+.3051	+.2382	.1164	.002512	0.51	0.51
57	+.4631	+.3198	.2920	.002748	1.40	1.40
58	+.3854	+.5529	.2379	.003877	1.62	1.62
59	+.3421	+.5469	.1903	.002596	0.87	0.86
60	+.3347	+.6789	.2079	.004291	1.57	1.57
61	+.2207	+.8454	.1331	.003317	0.78	0.78
62	+.2188	+.8587	.1362	.002634	0.63	0.63
63	+.2389	+.8660	.1609	.003353	0.95	0.95
64	+.2112	+.9048	.1485	.004355	1.14	1.14
65	+.1664	+.6862	.0322	.003419	0.20	0.20

YERKES PHOTOGRAPH No. 1254 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
1	+.0980	−.0020	.1183	.007360	1.64	1.47	+.0906	−.0019
2	+.0980	+.0080	.1182	.009706	2.08	1.91	+.0883	+.0082
3	+.0660	+.0060	.0863	.012242	1.82	1.71	+.0538	+.0062
4	+.0770	−.0110	.0975	.008086	1.45	1.31	+.0689	−.0109
5	+.0650	+.0190	.0850	.003360	0.61	0.49	+.0616	+.0191
6	+.0510	+.0020	.0714	.006242	0.84	0.74	+.0448	+.0021
7	+.0940	+.0300	.1138	.003181	0.79	0.62	+.0908	+.0301
8	+.1180	+.0230	.1379	.009740	2.45	2.25	+.1083	+.0232
9	+.0980	+.0515	.1174	.004835	1.14	0.97	+.0932	+.0516
10	+.0970	+.0425	.1166	.003460	0.87	0.69	+.0935	+.0426
11	+.0560	+.0710	.0751	.003583	0.57	0.46	+.0524	+.0711
12	+.0580	+.0675	.0772	.004633	0.71	0.60	+.0534	+.0676
13	+.0590	+.0785	.0780	.003170	0.54	0.42	+.0558	+.0786
14	+.1870	+.0300	.2065	.006433	2.59	2.27	+.1806	+.0301
15	+.1765	+.0315	.1960	.001561	0.83	0.53	+.1749	+.0315
16	+.1660	+.0470	.1853	.001483	0.76	0.48	+.1645	+.0470
17	+.1395	+.0360	.1591	.004768	1.54	1.30	+.1347	+.0361
18	+.1460	+.0370	.1655	.002421	0.95	0.69	+.1436	+.0370
19	+.1920	+.0640	.2108	.006143	2.54	2.22	+.1859	+.0641
20	+.1945	+.0715	.2132	.007003	2.88	2.55	+.1875	+.0716
21	+.1930	+.0770	.2116	.007562	3.05	2.73	+.1854	+.0771
22	+.1810	+.0720	.1997	.001651	0.88	0.57	+.1793	+.0720
23	+.1700	+.0760	.1887	.002444	1.09	0.80	+.1676	+.0760
24	+.1610	+.0790	.1797	.003059	1.22	0.95	+.1579	+.0791
25	+.1680	+.0680	.1869	.003450	1.40	1.11	+.1646	+.0681
26	+.1275	+.0900	.1461	.004679	1.39	1.17	+.1228	+.0901
27	+.1400	+.1030	.1583	.003181	1.11	0.87	+.1368	+.1031
28	+.1210	+.0460	.1404	.001148	0.50	0.28	+.1199	+.0460
29	+.1200	+.0010	.1402	.005617	1.55	1.34	+.1144	+.0011
30	+.2720	−.0140	.2918	.004713	2.82	2.37	+.2673	−.0139
31	+.2640	+.0690	.2824	.003763	2.27	1.84	+.2602	+.0691
32	+.3030	+.0490	.3215	.003719	2.56	2.07	+.2993	+.0491
33	+.1120	+.1350	.1297	.003036	0.87	0.68	+.1090	+.1351
34	+.1115	+.1335	.1293	.001483	0.53	0.33	+.1100	+.1335
35	+.1300	+.1830	.1467	.002444	0.84	0.62	+.1276	+.1830
36	+.1240	+.1840	.1407	.002902	0.92	0.70	+.1211	+.1841
37	+.2000	+.1700	.2167	.003573	1.67	1.34	+.1964	+.1701
38	+.1630	+.2465	.1782	.009608	3.16	2.90	+.1534	+.2467
39	+.1630	+.2510	.1781	.008726	2.90	2.64	+.1543	+.2512
40	+.1500	+.2490	.1652	.001483	0.68	0.42	+.1485	+.2490
41	+.2720	+.2800	.2859	.004771	2.79	2.35	+.2672	+.2801
42	+.2495	+.2705	.2637	.002691	1.63	1.23	+.2468	+.2705
43	+.0780	+.6010	.0838	.005367	0.88	0.76	+.0726	+.6011
44	+.0775	+.6040	.0832	.003286	0.59	0.47	+.0742	+.6041
45	+.1130	+.6015	.1187	.004696	1.13	0.95	+.1083	+.6016
46	+.1060	+.6040	.1116	.006485	1.39	1.22	+.0995	+.6041
47	+.1060	+.6000	.1117	.002414	0.63	0.46	+.1036	+.6000
48	+.1090	+.6080	.1145	.011832	2.39	2.23	+.0972	+.6082
49	+.1040	+.5950	.1099	.007984	1.63	1.47	+.0960	+.5951
50	+.1100	+.5775	.1165	.012815	2.61	2.45	+.0972	+.5777
51	+.1060	+.5710	.1127	.007211	1.53	1.37	+.0988	+.5711
52	+.1025	+.5680	.1093	.008743	1.75	1.60	+.0938	+.5682

YERKES PHOTOGRAPH NO. 1254 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
53	+.0905	+.5815	.0969	.002950	0.64	0.49	+.0876	+.5816
54A	+.1170	+.5590	.1240	.003219	0.87	0.68	+.1138	+.5591
54B	+.1020	+.5530	.1093	.006976	1.44	1.28	+.0950	+.5531
55	+.1240	+.5510	.1312	.003621	1.01	0.81	+.1204	+.5511
56	+.1310	+.5530	.1382	.015509	3.71	3.52	+.1155	+.5533
57	+.0960	+.5510	.1033	.002301	0.57	0.41	+.0937	+.5510
58	+.0960	+.4960	.1050	.002569	0.62	0.46	+.0934	+.4960
59	+.0900	+.5410	.0977	.002916	0.63	0.49	+.0871	+.5411
60	+.1045	+.5270	.1125	.013741	2.68	2.53	+.0908	+.5272
61	+.1035	+.5240	.1116	.011661	2.14	2.30	+.0918	+.5242
62	+.1040	+.5260	.1121	.011057	2.21	2.05	+.0929	+.5262
63	+.1075	+.5320	.1154	.011538	2.36	2.20	+.0960	+.5322
64	+.1025	+.5140	.1109	.008149	1.67	1.51	+.0944	+.5141
65	+.1260	+.5100	.1345	.005354	1.43	1.23	+.1206	+.5101
66	+.0475	+.4860	.0569	.014543	1.32	1.25	+.0330	+.4863
67	+.1000	+.4630	.1099	.009467	1.89	1.73	+.0905	+.4632
68	+.0610	+.4620	.0710	.009645	1.21	1.11	+.0514	+.4622
69	+.0685	+.3690	.0810	.008481	1.24	1.13	+.0600	+.3691
70	+.0780	+.6460	.0823	.004450	0.74	0.62	+.0736	+.6461
71	+.0780	+.6420	.0824	.009395	1.38	1.27	+.0686	+.6422
72	+.0750	+.6390	.0795	.010267	1.44	1.33	+.0647	+.6392
73	+.0480	+.6525	.0521	.011968	1.02	0.96	+.0360	+.6527
74	+.0450	+.6510	.0492	.008287	0.71	0.65	+.0367	+.6511
75	+.0480	+.6390	.0526	.010916	0.96	0.89	+.0371	+.6392
76	+.0680	+.6500	.0721	.005860	0.81	0.71	+.0621	+.6501
77	+.0580	+.6500	.0622	.005066	0.61	0.53	+.0529	+.6501
78	+.0700	+.6680	.0735	.014643	1.78	1.69	+.0554	+.6683
79	+.0990	+.6640	.1026	.007807	1.49	1.34	+.0912	+.6641
80	+.1050	+.6650	.1085	.004272	0.95	0.79	+.1007	+.6651
81	+.1530	+.6300	.1576	.010905	3.11	2.89	+.1421	+.6302
82	+.1530	+.6250	.1577	.008746	2.56	2.33	+.1443	+.6252
83	+.1390	+.6235	.1438	.002381	0.81	0.59	+.1366	+.6235
84	+.1190	+.6280	.1238	.023255	4.70	4.54	+.0958	+.6284
85	+.1275	+.6315	.1321	.026846	5.71	5.55	+.1007	+.6320
86	+.1190	+.6420	.1233	.005894	1.42	1.23	+.1131	+.6421
87	+.1230	+.6470	.1271	.008467	1.99	1.81	+.1145	+.6471
88	+.1250	+.6500	.1290	.004921	1.28	1.08	+.1201	+.6501
89	+.1280	+.6570	.1317	.010604	2.52	2.33	+.1174	+.6572
90	+.1360	+.6620	.1295	.009743	2.48	2.28	+.1263	+.6622
91	+.1400	+.6860	.1426	.011266	2.89	2.68	+.1287	+.6862
92	+.2200	+.6930	.2219	.009713	4.00	3.67	+.2103	+.6932
93	+.2090	+.7580	.2084	.005708	2.36	2.04	+.2033	+.7581
94	+.0640	+.6800	.0671	.022285	2.24	2.17	+.0417	+.6804
98	+.1440	+.8940	.1371	.008359	2.13	1.93	+.1356	+.8941
99	+.1250	+.8910	.1184	.005467	1.27	1.10	+.1195	+.8911
100	+.1720	+.9270	.1626	.004237	1.43	1.18	+.1678	+.9271
101	+.0505	+.9060	.0433	.010678	0.76	0.71	+.0398	+.9062
102	+.0610	+.8960	.0544	.014318	1.24	1.18	+.0467	+.8962
103	+.0760	+.8975	.0693	.007327	0.93	0.84	+.0687	+.8976
104	+.1030	+.8960	.0962	.009008	1.57	1.44	+.0940	+.8962
105	+.1300	+.9410	.1200	.004260	1.05	0.87	+.1257	+.9411

YERKES PHOTOGRAPH NO. 1254 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
106	+.0700	+.9460	.0600	.025885	2.17	2.12	+.0441	+.9464
107	+.0560	+.7590	.0560	.003020	0.37	0.29	+.0530	+.7591
108	+.1165	+.7825	.1154	.003816	0.93	0.75	+.1127	+.7826
109	+.1090	+.7830	.1079	.002383	0.61	0.44	+.1066	+.7830
110	+.1280	+.8125	.1255	.004971	1.25	1.06	+.1230	+.8126
111	+.0760	-.0250	.0968	.013728	2.28	2.15	+.0623	-.0248
112	+.0710	-.0290	.0919	.009426	1.56	1.43	+.0616	-.0288
113	+.0510	-.0390	.0721	.001505	0.30	0.19	+.0495	-.0390
114	+.0570	-.0520	.0783	.002611	0.47	0.35	+.0544	-.0520
115	+.0870	-.0525	.1082	.010130	1.97	1.82	+.0769	-.0523
116	+.0750	-.0350	.0960	.002444	0.55	0.40	+.0726	-.0350
117	+.1110	-.0680	.1324	.011426	2.71	2.52	+.0996	-.0678
118	+.1100	-.0670	.1314	.010019	2.39	2.20	+.1000	-.0668
119	+.1120	-.0720	.1335	.011203	2.68	2.49	+.1008	-.0718
120	+.0825	-.1030	.1045	.003605	0.80	0.64	+.0789	-.1029
121	+.1085	-.1360	.1310	.011058	2.60	2.41	+.0974	-.1358
122	+.1095	-.1380	.1320	.010734	2.55	2.36	+.0988	-.1378
124	+.1095	-.1415	.1320	.011326	2.68	2.49	+.0982	-.1413
125	+.1100	-.1430	.1326	.011326	2.69	2.50	+.0987	-.1428
126	+.1095	-.1445	.1321	.011315	2.68	2.49	+.0982	-.1443
127	+.0900	-.1410	.1126	.010600	2.14	1.98	+.0794	-.1408
128	+.0950	-.1520	.1177	.004175	1.02	0.84	+.0908	-.1519
129	+.0820	-.1450	.1046	.008209	1.58	1.44	+.0738	-.1449
130	+.1080	-.1990	.1313	.016187	3.65	3.47	+.0918	-.1987
131	+.1080	-.2010	.1314	.014846	3.38	3.20	+.0932	-.2007
132	+.1080	-.2025	.1314	.015036	3.42	3.24	+.0930	-.2022
133	+.1080	-.2070	.1314	.013114	3.03	2.85	+.0949	-.2068
134	+.1090	-.1910	.1322	.014209	3.28	3.09	+.0948	-.1908
135	+.1080	-.1900	.1312	.014533	3.32	3.13	+.0935	-.1897
136	+.1080	-.1850	.1311	.014801	3.37	3.19	+.0932	-.1847
137	+.0990	-.1790	.1221	.013963	2.96	2.80	+.0850	-.1788
138	+.0960	-.1740	.1190	.014466	2.98	2.81	+.0815	-.1737
139	+.0660	-.1950	.0894	.010086	1.60	1.48	+.0559	-.1948
140	+.0550	-.2005	.0785	.007683	1.11	1.00	+.0473	-.2004
141	+.0560	-.2030	.0795	.008778	1.26	1.15	+.0472	-.2028
142	+.0570	-.2050	.0805	.007829	1.16	1.04	+.0492	-.2049
143	+.0565	-.2060	.0800	.009371	1.34	1.23	+.0471	-.2058
144	+.0560	-.2080	.0796	.011113	1.54	1.43	+.0449	-.2078
145	+.0530	-.2140	.0766	.009561	1.30	1.19	+.0434	-.2138
146	+.0440	-.2065	.0676	.003147	0.46	0.36	+.0409	-.2064
147	+.1030	-.2510	.1270	.006165	1.52	1.33	+.0968	-.2509
148	+.1020	-.2450	.1259	.003796	1.01	0.82	+.0982	-.2449
149	+.1070	-.2820	.1314	.010835	2.56	2.37	+.0962	-.2818
150	+.1080	-.2870	.1324	.008891	2.17	1.98	+.0991	-.2868
151	+.1070	-.2880	.1314	.006992	1.75	1.56	+.1000	-.2879
152	+.1025	-.2890	.1269	.004377	1.14	0.95	+.0981	-.2889
153	+.0970	-.2850	.1214	.001841	0.57	0.39	+.0952	-.2850
154	+.0880	-.2820	.1124	.016590	3.15	3.00	+.0714	-.2817
155	+.0740	-.2450	.0980	.015494	2.56	2.43	+.0585	-.2447
156	+.0760	-.2490	.1000	.013125	2.27	2.13	+.0629	-.2488
157	+.0760	-.2520	.1001	.007505	1.40	1.26	+.0685	-.2519
158	+.0760	-.2575	.1001	.010220	1.83	1.69	+.0658	-.2573

YERKES PHOTOGRAPH No. 1254 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
159	+.0690	−.2640	.0932	.009125	1.54	1.41	+.0599	−.2638
160	+.0400	−.2610	.0642	.003505	0.47	0.38	+.0365	−.2609
161	+.0410	−.2630	.0653	.003919	0.53	0.43	+.0371	−.2629
162	+.0410	−.2660	.0653	.007203	0.86	0.77	+.0338	−.2659
163	+.0300	−.2620	.0543	.002053	0.27	0.19	+.0279	−.2620
164	+.0430	−.2770	.0674	.006265	0.79	0.70	+.0367	−.2769
165	+.0430	−.2740	.0674	.004947	0.65	0.56	+.0381	−.2739
166	+.0370	−.2460	.0611	.004477	0.55	0.46	+.0325	−.2459
167	+.1050	−.3090	.1297	.009595	2.27	2.08	+.0954	−.3088
168	+.1050	−.3140	.1297	.009651	2.28	2.10	+.0954	−.3138
169	+.0830	−.3095	.1077	.005874	1.23	1.07	+.0771	−.3094
170	+.0825	−.3110	.1072	.002746	0.67	0.51	+.0798	−.3110
171	+.0705	−.3020	.0952	.002343	0.53	0.38	+.0682	−.3020
172	+.0720	−.3125	.0968	.001829	0.45	0.30	+.0702	−.3125
173	+.0665	−.3125	.0913	.005182	0.93	0.80	+.0613	−.3124
175	+.0510	−.2990	.0757	.008254	1.13	1.03	+.0427	−.2989
176	+.0940	−.3530	.1191	.003048	0.80	0.62	+.0910	−.3529
177	+.0875	−.3345	.1125	.004578	1.04	0.88	+.0829	−.3344
178	+.0880	−.3310	.1129	.006668	1.44	1.27	+.0813	−.3309
179	+.0710	−.3610	.0963	.007909	1.41	1.27	+.0631	−.3609
180	+.0740	−.3640	.0993	.011943	2.07	1.94	+.0621	−.3638
181	+.0735	−.3690	.0988	.013932	2.36	2.23	+.0596	−.3688
182	+.0630	−.3650	.0883	.004925	0.86	0.74	+.0581	−.3649
183	+.0730	−.3880	.0985	.004389	0.88	0.73	+.0686	−.3879
184	+.0670	−.3790	.0924	.005048	0.92	0.79	+.0620	−.3789
185	+.1480	−.3990	.1734	.008837	2.85	2.60	+.1392	−.3988
186	+.1475	−.4060	.1729	.010290	3.26	3.00	+.1372	−.4058
187	+.1215	−.4030	.1470	.002288	0.81	0.58	+.1192	−.4030
188	+.1210	−.3980	.1465	.003607	1.13	0.91	+.1174	−.3979
189	+.1745	−.3860	.1997	.006446	2.50	2.20	+.1681	−.3859
190	+.2175	−.3740	.2424	.007989	3.68	3.31	+.2095	−.3739
191	+.2175	−.3800	.2424	.007329	3.41	3.04	+.2102	−.3799
192	+.2060	−.3575	.2308	.007977	3.49	3.15	+.1980	−.3574
193	+.2390	−.3320	.2633	.006971	3.55	3.15	+.2320	−.3319
194	+.2170	−.3260	.2414	.004177	2.11	1.74	+.2128	−.3259
195	+.2570	−.3120	.2810	.003831	2.29	1.86	+.2532	−.3119
196	+.2230	−.2785	.2469	.004065	2.11	1.73	+.2189	−.2784
197	+.1490	−.3025	.1734	.009127	2.94	2.68	+.1399	−.3023
198	+.1310	−.2925	.1554	.003416	1.15	0.91	+.1276	−.2924
199	+.1240	−.2920	.1484	.001964	0.73	0.50	+.1220	−.2920
200	+.1660	−.2315	.1896	.003461	1.42	1.13	+.1625	−.2314
201	+.1670	−.2285	.1905	.001483	0.78	0.49	+.1655	−.2285
202	+.1670	−.2270	.1905	.004612	1.80	1.51	+.1624	−.2269
203	+.1740	−.2230	.1974	.004098	1.69	1.39	+.1699	−.2229
204	+.1730	−.2140	.1963	.003740	1.56	1.26	+.1693	−.2139
205	+.1520	−.1900	.1751	.003394	1.29	1.02	+.1486	−.1899
206	+.1350	−.1390	.1574	.008701	2.55	2.32	+.1263	−.1388
207	+.1190	−.1380	.1415	.002343	0.79	0.57	+.1167	−.1380
208	+.1200	−.1340	.1424	.005036	1.44	1.22	+.1150	−.1339
209	+.1170	−.1190	.1392	.005717	1.56	1.36	+.1113	−.1189
210	+.1290	−.1080	.1510	.006734	1.95	1.73	+.1223	−.1079
211	+.1250	−.0880	.1467	.002019	0.74	0.51	+.1230	−.0880

YERKES PHOTOGRAPH No. 1254 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
212	+.1240	−.0760	.1455	.005404	1.56	1.34	+.1186	−.0759
213	+.1270	−.0510	.1481	.004689	1.41	1.19	+.1223	−.0509
214	+.1180	−.0510	.1391	.001963	0.68	0.47	+.1160	−.0510
215	+.1500	−.0250	.1706	.005628	1.90	1.64	+.1444	−.0249
216	+.2780	−.0430	.2983	.004612	2.83	2.37	+.2734	−.0429
217	+.3295	−.0950	.3502	.004132	3.04	2.50	+.3254	−.0949
218	+.1400	−.4520	.1658	.005541	1.82	1.57	+.1345	−.4519
219	+.1405	−.4570	.1663	.007206	2.29	2.04	+.1333	−.4569
220	+.1365	−.4600	.1624	.005440	1.75	1.51	+.1311	−.4599
221	+.1665	−.4720	.1923	.006011	2.27	1.98	+.1605	−.4719
222	+.1050	−.4520	.1309	.010179	2.42	2.23	+.0948	−.4518
223	+.1040	−.5070	.1303	.018463	4.06	3.89	+.0855	−.5067
224	+.1025	−.5050	.1288	.015937	3.53	3.35	+.0866	−.5047
225	+.0990	−.5000	.1252	.018005	3.81	3.64	+.0810	−.4997
226	+.1000	−.5150	.1263	.017961	3.84	3.67	+.0820	−.5147
227	+.0975	−.5190	.1238	.018531	3.86	3.69	+.0790	−.5187
228	+.0770	−.5075	.1033	.002311	0.57	0.41	+.0747	−.5075
229	+.1440	−.4960	.1701	.004994	1.71	1.46	+.1390	−.4959
230	+.1280	−.4820	.1541	.001372	0.60	0.37	+.1266	−.4820
231	+.1160	−.4960	.1422	.002881	0.92	0.70	+.1131	−.4959
232	+.2120	−.4375	.2374	.005061	2.43	2.07	+.2069	−.4374
233	+.2380	−.5000	.2636	.005599	2.94	2.54	+.2324	−.4999
234	+.2460	−.5200	.2717	.003385	2.01	1.59	+.2426	−.5199
235	+.2175	−.5410	.2434	.006136	2.94	2.57	+.2114	−.5409
236	+.2180	−.5370	.2439	.004917	2.44	2.06	+.2131	−.5369
237	+.1875	−.5360	.2136	.003653	1.67	1.35	+.1838	−.5359
238	+.1180	−.5220	.1443	.002378	0.81	0.59	+.1156	−.5220
239	+.1340	−.5450	.1603	.005911	1.86	1.62	+.1281	−.5449
240	+.1205	−.5550	.1469	.001741	0.67	0.44	+.1188	−.5550
241	+.1150	−.5450	.1414	.002725	0.88	0.66	+.1123	−.5450
242	+.0410	−.5575	.0676	.024468	2.42	2.36	+.0165	−.5571
243	+.0380	−.5660	.0647	.033266	2.83	2.78	+.0047	−.5654
244	+.0430	−.5540	.0696	.030996	2.98	2.92	+.0120	−.5535
245	+.0745	−.5700	.1011	.016208	2.75	2.62	+.0583	−.5697
246	+.0760	−.5760	.1026	.014274	2.51	2.37	+.0617	−.5758
247	+.0750	−.5780	.1016	.014453	2.51	2.37	+.0606	−.5777
248	+.1080	−.5975	.1346	.011044	2.67	2.48	+.0970	−.5973
249	+.1080	−.5990	.1346	.009255	2.29	2.09	+.0987	−.5988
250	+.1000	−.5870	.1266	.004771	1.22	1.03	+.0952	−.5869
251	+.0990	−.5925	.1256	.002435	0.72	0.53	+.0966	−.5925
252	+.2165	−.5635	.2425	.010799	4.82	4.46	+.2057	−.5633
253	+.1650	−.5640	.1913	.006706	2.48	2.19	+.1583	−.5639
254	+.1820	−.6050	.2083	.004728	2.01	1.69	+.1773	−.6049
255	+.1625	−.5940	.1889	.003028	1.28	0.99	+.1595	−.5939
256	+.0875	−.6125	.1142	.008976	1.88	1.71	+.0785	−.6123
257	+.0860	−.6080	.1127	.012587	2.48	2.33	+.0734	−.6078
258	+.0560	−.6170	.0828	.004783	0.79	0.67	+.0512	−.6169
259	+.1335	−.6725	.1600	.014380	4.05	3.82	+.1191	−.6723
260	+.1310	−.6690	.1575	.015432	4.24	4.02	+.1156	−.6687
261	+.1320	−.6765	.1585	.014515	4.04	3.82	+.1175	−.6762
262	+.1100	−.6410	.1366	.012813	3.10	2.90	+.0972	−.6408
263	+.0910	−.6600	.1177	.005388	1.25	1.08	+.0856	−.6599

YERKES PHOTOGRAPH No. 1254 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
264	+.0415	-.6700	.0683	.014468	1.62	1.54	+.0270	-.6697
265	+.0440	-.6760	.0708	.016985	1.92	1.84	+.0270	-.6757
266	+.0410	-.6640	.0678	.016704	1.81	1.73	+.0243	-.6637
267	+.0685	-.6930	.0952	.013217	2.16	2.04	+.0553	-.6928
268	+.0690	-.6960	.0957	.012222	2.03	1.90	+.0568	-.6958
269	+.1000	-.7300	.1265	.015704	3.41	3.24	+.0843	-.7297
270	+.0960	-.7100	.1226	.005378	1.30	1.12	+.0906	-.7099
271	+.1300	-.7160	.1564	.008399	2.45	2.22	+.1216	-.7159
272	+.1590	-.7240	.1852	.003365	1.36	1.07	+.1556	-.7239
273	+.1840	-.7340	.2101	.007046	2.85	2.53	+.1770	-.7339
274	+.1695	-.7335	.1956	.003466	1.47	1.17	+.1660	-.7334
275	+.1595	-.7430	.1856	.004910	1.85	1.56	+.1546	-.7429
276	+.1560	-.7500	.1821	.004496	1.68	1.41	+.1515	-.7499
277	+.1780	-.7540	.2040	.005917	2.38	2.07	+.1721	-.7539
278	+.1300	-.7700	.1561	.010225	2.91	2.69	+.1198	-.7698
279	+.1310	-.7920	.1569	.002371	0.88	0.64	+.1286	-.7920
280	+.1530	-.7830	.1789	.004732	1.72	1.45	+.1483	-.7829
281	+.0970	-.7560	.1233	.010727	2.38	2.20	+.0863	-.7558
282	+.0930	-.7600	.1193	.012741	2.67	2.50	+.0803	-.7598
284	+.0900	-.7630	.1163	.011634	2.40	2.24	+.0784	-.7628
285	+.0710	-.7680	.0973	.007986	1.43	1.30	+.0630	-.7679
286	+.0860	-.7680	.1123	.014263	2.76	2.61	+.0717	-.7678
287	+.0860	-.7690	.1123	.022990	4.17	4.03	+.0630	-.7686
288	+.0430	-.7750	.0693	.015102	1.71	1.62	+.0279	-.7747
289	+.0460	-.7770	.0723	.019992	2.25	2.17	+.0260	-.7767
290	+.0550	-.7480	.0815	.014183	1.94	1.84	+.0408	-.7478
291	+.0510	-.7520	.0775	.009932	1.36	1.25	+.0411	-.7518
292	+.0560	-.7350	.0826	.016028	2.18	2.08	+.0400	-.7347
293	+.0340	-.7380	.0606	.005747	0.66	0.58	+.0283	-.7379
294	+.0220	-.7390	.0486	.003342	0.34	0.27	+.0187	-.7389
295	+.0105	-.7525	.0370	.004081	0.30	0.25	+.0064	-.7524
296	+.0680	-.7580	.0944	.004003	0.78	0.64	+.0640	-.7579
297	+.1310	-.7680	.1571	.010930	3.11	2.88	+.1201	-.7678
298	+.1250	-.7550	.1512	.005223	1.58	1.35	+.1198	-.7549
299	+.1190	-.7460	.1453	.003153	1.01	0.79	+.1158	-.7459
300	+.0800	-.8110	.1059	.019235	3.36	3.22	+.0608	-.8107
301	+.0610	-.8135	.0869	.006455	1.06	0.94	+.0545	-.8134
302	+.0770	-.8200	.1028	.015118	2.64	2.51	+.0619	-.8197
303	+.0980	-.8240	.1237	.003345	0.90	0.71	+.0947	-.8239
304	+.0980	-.8200	.1237	.012500	2.73	2.55	+.0855	-.8198
305	+.0750	-.8235	.1008	.001845	0.47	0.32	+.0732	-.8235
306	+.0485	-.8230	.0744	.003356	0.53	0.42	+.0451	-.8229
307	+.1275	-.8340	.1529	.012009	3.29	3.07	+.1155	-.8338
308	+.1270	-.8370	.1524	.011427	3.14	2.92	+.1156	-.8368
309	+.1260	-.8390	.1514	.012065	3.27	3.05	+.1139	-.8388
310	+.1980	-.7600	.2238	.007081	3.05	2.71	+.1909	-.7599
311	+.1830	-.7740	.2088	.004060	1.78	1.46	+.1789	-.7739
312	+.2005	-.7915	.2260	.002405	1.29	0.94	+.1981	-.7915
313	+.2190	-.7960	.2443	.005483	2.68	2.30	+.2135	-.7959
314	+.2140	-.8320	.2388	.003402	1.77	1.40	+.2106	-.8319
315	+.1950	-.8290	.2201	.005383	2.37	2.03	+.1896	-.8289

YERKES PHOTOGRAPH NO. 1254 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
316	+.1670	−.8200	.1924	.004700	1.85	1.55	+.1623	−.8199
317	+.1670	−.8200	.1924	.003479	1.45	1.15	+.1635	−.8199
318	+.1440	−.8140	.1696	.003658	1.33	1.07	+.1403	−.8139
319	+.1860	−.8090	.2114	.003502	1.60	1.28	+.1825	−.8089
320	+.1760	−.7970	.2016	.003266	1.44	1.14	+.1727	−.7969
321	+.1530	−.7840	.1789	.004810	1.75	1.48	+.1482	−.7839
322	+.1185	−.8640	.1435	.010086	2.64	2.43	+.1084	−.8638
323	+.1160	−.8620	.1410	.008619	2.26	2.05	+.1074	−.8619
324	+.1010	−.8635	.1261	.005865	1.44	1.26	+.0951	−.8634
325	+.0995	−.8540	.1247	.005338	1.32	1.13	+.0942	−.8539
326	+.1370	−.8520	.1621	.008294	2.52	2.28	+.1287	−.8519
327	+.1520	−.8520	.1770	.004410	1.61	1.34	+.1476	−.8519
328	+.1640	−.8490	.1890	.007589	2.73	2.44	+.1564	−.8489
329	+.0950	−.8730	.1199	.004555	1.11	0.93	+.0904	−.8729
330	+.1115	−.8780	.1362	.006762	1.76	1.56	+.1047	−.8779
331	+.1380	−.8720	.1627	.006661	2.09	1.85	+.1313	−.8719
332	+.1340	−.8760	.1587	.005351	1.69	1.45	+.1287	−.8759
333	+.2045	−.8800	.2285	.005766	2.61	2.26	+.1987	−.8799
334	+.2450	−.8900	.2682	.006395	3.36	2.95	+.2386	−.8899
335	+.1685	−.8960	.1924	.006271	2.35	2.06	+.1622	−.8959
336	+.1875	−.8960	.2112	.015355	5.75	5.44	+.1722	−.8957
337	+.1520	−.8980	.1760	.002664	1.08	0.81	+.1493	−.8980
338	+.1390	−.8960	.1631	.004691	1.56	1.31	+.1343	−.8959
339	+.1010	−.9000	.1253	.018454	3.89	3.73	+.0826	−.8997
340	+.1020	−.9020	.1262	.016237	3.51	3.34	+.0858	−.9017
341	+.0990	−.9060	.1231	.018075	3.75	3.59	+.0809	−.9057
342	+.0830	−.9025	.1073	.002631	0.65	0.48	+.0804	−.9025
343	+.0700	−.9050	.0943	.010290	1.73	1.60	+.0597	−.9048
344	+.0510	−.8875	.0758	.010971	1.44	1.34	+.0400	−.8873
345	+.0510	−.8860	.0758	.012348	1.59	1.50	+.0387	−.8858
346	+.0315	−.8850	.0564	.009930	0.96	0.89	+.0216	−.8848
347	+.0570	−.8860	.0818	.001801	0.38	0.25	+.0552	−.8860
348	+.0650	−.8725	.0900	.026700	3.66	3.56	+.0383	−.8720
349	+.0660	−.8775	.0909	.028615	3.91	3.82	+.0374	−.8770
350	+.0560	−.8370	.0817	.009400	1.37	1.26	+.0466	−.8368
351	+.1190	−.8910	.1434	.007916	2.13	1.92	+.1111	−.8909
352	+.1290	−.8890	.1534	.007390	2.15	1.92	+.1216	−.8889
353	+.1290	−.9060	.1529	.006293	1.87	1.64	+.1227	−.9059
354	+.1320	−.9130	.1557	.005846	1.79	1.55	+.1262	−.9129
355	+.1060	−.9145	.1298	.004860	1.27	1.08	+.1011	−.9144
356	+.0900	−.9160	.1139	.006697	1.45	1.29	+.0833	−.9159
357	+.1015	−.9220	.1251	.013004	2.86	2.68	+.0885	−.9218
358	+.1080	−.9270	.1314	.006015	1.54	1.34	+.1020	−.9269
359	+.1130	−.9315	.1362	.001433	0.55	0.34	+.1116	−.9315
360	+.1130	−.9375	.1360	.007483	1.92	1.72	+.1055	−.9374
361	+.0540	−.9280	.0776	.030601	3.39	3.32	+.0234	−.9275
362	+.0560	−.9190	.0799	.024124	2.94	2.85	+.0319	−.9186
363	+.0975	−.9570	.1197	.027970	5.29	5.15	+.0695	−.9565
364	+.0960	−.9530	.1184	.020136	3.95	3.80	+.0759	−.9526
365	+.1215	−.9720	.1425	.015739	3.88	3.69	+.1058	−.9717
366	+.1060	−.9620	.1278	.012832	2.89	2.71	+.0932	−.9618
367	+.2250	−.9550	.2455	.007971	3.72	3.35	+.2170	−.9549

YERKES PHOTOGRAPH NO. 1269 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
1	+.0310	+.1320	.2591	.005717	2.90	2.55	+.0254	+.1321
2	+.0300	+.1360	.2580	.005817	2.93	2.58	+.0243	+.1361
3	+.0180	+.1330	.2465	.002353	1.34	1.00	+.0157	+.1330
4	+.0700	+.0750	.2989	.004400	2.68	2.27	+.0657	+.0751
5	+.0380	+.3700	.2473	.004624	2.30	1.97	+.0335	+.3701
6	+.0335	+.5090	.2247	.008015	3.37	3.08	+.0257	+.5091
7	+.0330	+.5550	.2167	.009445	3.77	3.48	+.0238	+.5552
8	-.0360	+.4925	.1596	.007205	2.16	1.95	-.0430	+.4926
9	-.0370	+.4960	.1581	.007516	2.22	2.02	-.0443	+.4961
10	-.0820	+.4930	.1141	.008113	1.70	1.55	-.0899	+.4931
11	-.0825	+.5020	.1122	.007139	1.49	1.35	-.0894	+.5021
12	+.1530	+.6310	.3156	.005515	3.43	3.00	+.1476	+.6311
13	+.1530	+.6240	.3170	.003997	2.62	2.19	+.1491	+.6241
14	+.0920	+.6010	.2646	.005902	3.04	2.69	+.0863	+.6011
15	+.0775	+.8280	.1910	.005078	1.92	1.66	+.0726	+.8281
16	+.0530	+.8550	.1575	.009694	2.78	2.57	+.0436	+.8552
17	+.0050	+.8900	.0962	.013304	2.19	2.07	-.0079	+.8902
18	-.0130	+.8900	.0787	.004170	0.66	0.56	-.0171	+.8901
19	+.0595	+.9060	.1403	.005015	1.39	1.20	+.0546	+.9061
20	+.0505	+.9060	.1319	.002351	0.71	0.53	+.0482	+.9060
21	+.1565	+.8590	.2514	.016054	7.13	6.81	+.1409	+.8593
22	-.0250	-.0970	.2095	.008294	3.24	2.96	-.0331	-.0969
23	-.0260	-.1050	.2085	.001874	3.53	3.26	-.0349	-.1048
24	-.0370	-.1140	.1976	.003536	1.47	1.20	-.0404	-.1139
25	-.0620	-.0925	.1732	.004831	1.67	1.43	-.0667	-.0924
26	-.0735	-.0925	.1618	.002529	0.92	0.71	-.0760	-.0925
27	-.1070	-.0680	.1286	.003990	1.05	0.88	-.1109	-.0679
28	-.1140	-.0780	.1216	.005948	1.39	1.23	-.1198	-.0779
29	-.1140	-.0840	.1216	.005318	1.26	1.10	-.1192	-.0839
30	-.1550	-.0770	.0805	.007044	1.04	0.94	-.1618	-.0769
31	-.0945	-.0110	.1406	.009301	2.38	2.20	-.1035	-.0108
32	-.1080	-.0110	.1272	.002552	0.73	0.56	-.1105	-.0110
34	-.1075	-.0070	.1276	.003470	0.93	0.76	-.1109	-.0069
35	-.1225	+.0020	.1125	.005572	1.21	1.06	-.1279	+.0021
36	-.1230	+.0080	.1119	.007708	1.59	1.45	-.1305	+.0081
37	-.1000	+.0445	.1340	.007597	1.89	1.72	-.1074	+.0446
38	+.0090	-.0740	.2427	.001733	1.06	0.73	+.0073	-.0740
39	-.0090	-.0810	.2252	.001655	0.95	0.65	-.0106	-.0810
40	-.0070	-.0890	.2271	.001810	1.02	0.71	-.0088	-.0890
41	-.0140	-.0920	.2203	.003050	1.46	1.16	-.0170	-.0919
43	-.1280	-.2030	.1055	.005196	1.07	0.93	-.1331	-.2029
44	-.1300	-.2000	.1036	.006236	1.22	1.09	-.1361	-.1999
45	+.1090	-.1360	.3381	.003648	2.59	2.13	+.1055	-.1359
46	+.1100	-.0675	.3395	.004367	3.02	2.56	+.1058	-.0674
47	+.1070	-.2590	.3324	.003958	2.73	2.27	+.1032	-.2589
48	+.1025	-.2470	.3287	.001091	1.07	0.62	+.1014	-.2470
49	+.1045	-.2680	.3296	.001623	1.38	0.93	+.1029	-.2680
50	+.0750	-.2890	.3005	.001921	1.41	1.00	+.0731	-.2890
51	-.0355	-.3125	:1923	.005119	1.95	1.69	-.0405	-.3124
52	-.0640	-.2710	.1665	.014005	4.10	3.89	-.0776	-.2708
53	-.0630	-.2800	.1670	.014116	4.14	3.93	-.0767	-.2798

YERKES PHOTOGRAPH NO. 1269 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
54	-.0860	-.2750	.1445	.004400	1.28	1.09	-.0903	-.2749
55	-.1175	-.2610	.1138	.001888	0.52	0.37	-.1193	-.2610
56	-.1380	-.2660	.0930	.002718	0.56	0.43	-.1406	-.2660
57	-.1200	-.3800	.1038	.001822	0.47	0.33	-.1218	-.3800
58	-.1270	-.3580	.0985	.001988	0.47	0.34	-.1289	-.3580
59	-.0485	-.3750	.1752	.010388	3.30	3.07	-.0586	-.3748
60	-.0835	-.3710	.1409	.003670	1.08	0.89	-.0871	-.3709
61	-.0375	-.4040	.1837	.002397	1.01	0.76	-.0398	-.4040
62	-.0380	-.4000	.1835	.004168	1.56	1.31	-.0421	-.3999
63	+.0025	-.4220	.2211	.006648	2.81	2.52	-.0040	-.4219
64	-.0810	-.4320	.1382	.008773	2.22	2.04	-.0895	-.4319
65	-.0820	-.4270	.1377	.005641	1.50	1.32	-.0875	-.4269
66	-.0960	-.4275	.1237	.003028	0.81	0.64	-.0989	-.4274
67	-.0950	-.4340	.1241	.003781	0.97	0.80	-.0987	-.4339
68	-.0930	-.4400	.1255	.012735	2.79	2.64	-.1054	-.4398
69	-.0735	-.4230	.1465	.007356	2.02	1.83	-.0807	-.4229
70	-.0740	-.4180	.1464	.003217	1.01	0.81	-.0771	-.4179
71	-.0740	-.4230	.1460	.010189	2.68	2.50	-.0839	-.4228
72	-.0660	-.4040	.1556	.007090	2.08	1.87	-.0729	-.4039
73	-.0660	-.4630	.1499	.004147	1.27	1.07	-.0700	-.4629
74	+.0140	-.5460	.2183	.004735	2.07	1.78	+.0094	-.5459
75	-.0310	-.5615	.1723	.005056	1.72	1.49	-.0359	-.5614
76	-.0215	-.5140	.1879	.008797	3.05	2.81	-.0301	-.5139
77	-.0090	-.6030	.1876	.008190	2.86	2.61	-.0170	-.6029
78	-.0105	-.5965	.1872	.017823	5.76	5.53	-.0278	-.5962
79	-.0080	-.5980	.1894	.007105	2.55	2.30	-.0149	-.5979
80	-.0080	-.6010	.1889	.007504	2.67	2.42	-.0153	-.6009
81	-.0275	-.6010	.1698	.002842	1.06	0.83	-.0303	-.6010
82	-.0250	-.6050	.1716	.001270	0.61	0.38	-.0262	-.6050
83	-.0040	-.5890	.1947	.005322	2.04	1.78	-.0092	-.5889
84	-.0400	-.6055	.1568	.008013	2.33	2.13	-.0478	-.6054
85	-.0405	-.5860	.1594	.005643	1.75	1.54	-.0460	-.5859
86	-.1040	-.5355	.1035	.013181	2.35	2.22	-.1168	-.5353
87	-.1230	-.5345	.0846	.007126	1.11	1.00	-.1299	-.5344
88	-.1045	-.5380	.1027	.011022	1.99	1.86	-.1152	-.5378
89	-.1210	-.5300	.0872	.009085	1.41	1.31	-.1298	-.5298
90	-.0805	-.5000	.1314	.003564	0.76	0.58	-.0830	-.5000
91	-.0925	-.5000	.1195	.002210	0.62	0.45	-.0946	-.5000
92	-.0885	-.5590	.1158	.003749	0.90	0.74	-.0921	-.5589
93	-.0910	-.5675	.1121	.001225	0.39	0.24	-.0922	-.5675
94	-.1150	-.5565	.0896	.007215	1.19	1.08	-.1220	-.5564
95	-.1110	-.6110	.0853	.011590	1.70	1.60	-.1223	-.6108
96	-.0925	-.6150	.1032	.016595	2.86	2.74	-.1086	-.6147
97	-.0935	-.6200	.1014	.011147	1.98	1.86	-.1043	-.6198
98	-.1050	-.6375	.0868	.009177	1.42	1.31	-.1139	-.6373
99	-.0810	-.6460	.1093	.005113	1.09	0.95	-.0860	-.6459
100	-.0815	-.6380	.1102	.009642	1.91	1.77	-.0909	-.6378
101	-.0830	-.6680	.1032	.012910	2.30	2.17	-.0956	-.6678
102	-.0840	-.6530	.1050	.007804	1.51	1.37	-.0916	-.6529
103	-.0745	-.6900	.1072	.008104	1.59	1.45	-.0824	-.6899
104	-.0815	-.6805	.1022	.014871	2.57	2.45	-.0960	-.6802
105	-.0710	-.7000	.1086	.012125	2.30	2.16	-.0828	-.6998

YERKES PHOTOGRAPH No. 1269 NORMAL MEASUREMENTS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT	ξ_T	η_T
106	-.0315	-.6840	.1510	.007041	2.00	1.81	-.0383	-.6839
107	-.0325	-.6910	.1486	.008702	2.38	2.18	-.0410	-.6909
108	-.0210	-.6820	.1617	.005346	1.69	1.48	-.0262	-.6819
109	.0000	-.6920	.1802	.005402	1.91	1.67	-.0053	-.6919
110	+.0180	-.6575	.2044	.009698	3.63	3.37	+.0086	-.6573
111	+.0290	-.6490	.2166	.006032	2.53	2.24	+.0231	-.6489
112	+.0300	-.6320	.2206	.008878	3.63	3.34	+.0214	-.6319
113	+.0295	-.6350	.2196	.009542	3.85	3.57	+.0202	-.6348
114	+.0110	-.6350	.2017	.002831	1.26	0.99	+.0082	-.6350
115	+.0370	-.6100	.2310	.004182	1.98	1.66	+.0329	-.6099
116	+.0370	-.5940	.2336	.004558	2.15	1.83	+.0326	-.5939
117	+.0410	-.5570	.2429	.004314	2.13	1.81	+.0368	-.5569
118	+.0435	-.5490	.2464	.006041	2.89	2.56	+.0376	-.5489
119	+.0630	-.5540	.2643	.006230	3.19	2.83	+.0569	-.5539
120	+.0540	-.5200	.2602	.002819	1.62	1.27	+.0513	-.5200
121	-.0460	-.7230	.1284	.007363	1.76	1.60	-.0532	-.7229
122	-.0840	-.7425	.0860	.007475	1.18	1.07	-.0913	-.7424
123	-.0880	-.7525	.0795	.005736	0.86	0.76	-.0936	-.7524
124	-.0140	-.8190	.1341	.013341	3.12	2.96	-.0270	-.8188
125	-.0390	-.8240	.1079	.005528	1.15	1.01	-.0444	-.8239
126	-.0400	-.8140	.1101	.004319	0.95	0.81	-.0442	-.8139
127	-.0130	-.8110	.1376	.003865	1.09	0.91	-.0168	-.8109
128	-.0310	-.8320	.1132	.002746	0.68	0.53	-.0337	-.8320
129	+.0130	-.8230	.1591	.003089	1.06	0.85	+.0100	-.8229
130	+.0120	-.8270	.1568	.005883	1.78	1.57	+.0063	-.8269
131	+.0790	-.8115	.2256	.008055	3.40	3.11	+.0712	-.8114
132	+.0610	-.8140	.2079	.002945	1.34	1.06	+.0581	-.8140
133	+.0450	-.8120	.1933	.007312	2.67	2.41	+.0379	-.8119
134	+.0480	-.7980	.2003	.007134	2.71	2.44	+.0411	-.7979
135	+.0310	-.7980	.1841	.004463	1.66	1.41	+.0267	-.7979
136	+.0710	-.7760	.2284	.007100	3.08	2.78	+.0641	-.7759
137	+.0700	-.7680	.2296	.003587	1.73	1.42	+.0665	-.7679
138	+.0420	-.7700	.2024	.005171	2.07	1.80	+.0370	-.7699
139	+.0300	-.7550	.1948	.006390	2.39	2.13	+.0238	-.7549
140	+.0210	-.7180	.1949	.003597	1.47	1.21	+.0175	-.7179
142	+.0980	-.8220	.2401	.006548	3.02	2.70	+.0916	-.8219
143	+.0890	-.7800	.2443	.005028	2.44	2.11	+.0841	-.7799
144	+.0650	-.8715	.1914	.010675	3.70	3.45	+.0546	-.8713
145	+.0730	-.8840	.1937	.006296	2.34	2.09	+.0669	-.8839
146	+.0610	-.8590	.1925	.004609	1.78	1.52	+.0565	-.8589
147	+.0370	-.8660	.1670	.004709	1.57	1.35	+.0324	-.8659
148	+.0230	-.8670	.1532	.004377	1.35	1.15	+.0187	-.8669
149	-.0010	-.8780	.1256	.003135	0.84	0.68	-.0040	-.8779
150	-.0160	-.8650	.1161	.005873	1.31	1.16	-.0217	-.8649
151	+.0510	-.8870	.1717	.004222	1.47	1.24	+.0469	-.8869
152	+.0480	-.8950	.1653	.008515	2.60	2.38	+.0397	-.8949
153	+.0240	-.8975	.1413	.002803	0.87	0.68	+.0213	-.8975
154	+.0560	-.9170	.1621	.010336	3.03	2.82	+.0460	-.9168
155	-.0045	-.9380	.0924	.039218	5.04	4.97	-.0426	-.9373
156	-.0010	-.9460	.0907	.032753	4.32	4.24	-.0328	-.9454
157	+.0610	-.9510	.1461	.010485	2.76	2.57	+.0508	-.9508

Yerkes Photograph No. 1269 Normal Measurements

Point	ξ	η	Sin ϕ	$\chi - \Delta\chi$	Height	Adjusted Height	ξ_T	η_T
158	+.0970	−.9570	.1743	.016813	5.07	4.85	+.0807	−.9567
159	+.0950	−.9510	.1771	.009653	3.12	2.89	+.0856	−.9508
160	+.0780	−.9410	.1686	.010694	3.25	3.04	+.0676	−.9408
161	+.0760	−.9380	.1687	.007676	2.42	2.20	+.0685	−.9379
162	+.1020	−.9220	.2019	.007420	2.82	2.56	+.0948	−.9219
163	+.1010	−.9000	.2124	.010080	3.91	3.64	+.0912	−.8998
164	+.0360	−.9410	.1294	.016386	3.61	3.46	+.0201	−.9407
165	+.1210	−.9700	.1832	.013699	4.44	4.20	+.1077	−.9698
166	+.1060	−.9620	.1780	.008345	2.76	2.52	+.0979	−.9619

YERKES PHOTOGRAPH NO. 1269 SMALL CRATERS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT
1	+.0088	+.1223	.2381	.001003	0.74	0.42
2	+.0235	+.1517	.2509	.001955	1.20	0.85
3	+.0073	+.1559	.2350	.000770	0.64	0.32
4	+.0990	+.1440	.3236	.000693	0.84	0.39
5	+.0880	+.1324	.3137	.000671	0.80	0.37
6	+.0743	+.1976	.2970	.000693	0.77	0.36
7	+.1010	+.1900	.3229	.000439	0.69	0.25
8	+.1757	+.2093	.3918	.001546	1.59	1.05
9	+.1582	+.1701	.3779	.000428	0.80	0.28
10	+.1437	+.1338	.3663	.000461	0.80	0.29
11A	+.2421	+.2556	.4495	.000516	1.02	0.40
11B	+.2506	+.3356	.4499	.000948	1.36	0.74
12	+.1906	+.3356	.3949	.002321	2.14	1.60
13	+.1037	+.3386	.3134	.001092	1.03	0.60
14	+.1050	+.3290	.3155	.000461	0.69	0.25
15	+.0723	+.3365	.2837	.001136	0.95	0.56
16	+.0932	+.3518	.3020	.000738	0.80	0.39
17	+.0723	+.3365	.2837	.001158	0.96	0.57
18	+.0807	+.3739	.2878	.002055	1.43	1.03
19	+.0725	+.4002	.2769	.002687	1.68	1.30
20	+.0868	+.4095	.2894	.001269	1.04	0.64
21	+.1362	+.4121	.3357	.000395	0.69	0.23
22	+.1501	+.4074	.3493	.000284	0.65	0.17
23	+.2108	+.5075	.3914	.000739	1.04	0.50
24	+.2034	+.5342	.3802	.000418	0.80	0.28
25	−.0633	+.2576	.1591	.001346	0.59	0.37
26	−.0328	+.2570	.1892	.001534	0.77	0.51
27	−.0390	+.1617	.1895	.001147	0.64	0.38
28	−.0613	+.1103	.1701	.000903	0.50	0.27
29	−.0916	+.3280	.1248	.000306	0.24	0.07
30	+.0442	+.4298	.2462	.001114	0.82	0.48
31	+.0660	+.5533	.2486	.000683	0.64	0.30
32	−.0126	+.6397	.1563	.001060	0.51	0.29
33	−.0020	+.6332	.1680	.000728	0.45	0.21
34	+.0492	+.6602	.2116	.002413	1.19	0.89
35	+.0518	+.6424	.2180	.002767	1.36	1.05
36	+.0550	+.6728	.2143	.000795	0.59	0.30
37	+.0554	+.6936	.2098	.000983	0.65	0.36
38	+.0957	+.6541	.2571	.001382	0.97	0.62
39	+.1013	+.6654	.2598	.003709	2.05	1.69
40	+.0932	+.6812	.2486	.002812	1.57	1.22
41	+.0984	+.7713	.2294	.001516	0.92	0.61
42	+.1133	+.7824	.2399	.003269	1.71	1.37
43	+.0658	+.7578	.2027	.001982	0.98	0.70
44	+.0259	+.0214	.2581	.000936	0.78	0.42
45	+.0070	+.0204	.2398	.001412	0.92	0.59
46	+.0527	−.0385	.2848	.002153	1.46	1.07
47	+.0535	−.0324	.2855	.000261	0.52	0.13
48	+.1221	−.0500	.3509	.003459	2.61	2.12
49	+.1078	+.0149	.3365	.001091	1.10	0.64
50	+.1119	+.0172	.3404	.000826	0.96	0.49

YERKES PHOTOGRAPH NO. 1269 SMALL CRATERS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT
51	+.1038	+.0608	.3316	.000837	0.94	0.48
52	+.1129	+.0527	.3404	.000748	0.91	0.44
53	+.0486	−.0040	.2804	.000737	0.75	0.36
54	+.0476	−.0825	.2800	.000826	0.79	0.40
55	+.0395	−.0737	.2722	.000759	0.73	0.36
56	+.0369	−.0778	.2697	.000637	0.67	0.30
57	+.0559	−.1318	.2875	.003658	2.24	1.84
58	+.0423	−.1374	.2744	.002452	1.55	1.17
59	+.0374	−.1417	.2696	.002253	1.43	1.06
60	+.0304	−.1216	.2631	.000527	0.60	0.24
61	+.0178	−.1028	.2511	.001146	0.85	0.50
62	+.0260	−.1366	.2587	.001014	0.81	0.46
63	+.0230	−.1349	.2558	.000870	0.74	0.39
64	+.0330	−.1643	.2649	.003194	1.85	1.48
65	+.0503	−.1478	.2819	.001324	1.04	0.65
66	+.0722	−.1551	.3028	.001755	1.34	0.93
67	+.0783	−.1715	.3082	.001600	1.28	0.86
68	+.0640	−.1789	.2944	.001080	0.96	0.55
69	+.0441	−.2169	.2741	.000604	0.67	0.29
70	+.0309	−.2164	.2614	.001014	0.82	0.46
71	+.0254	−.2277	.2557	.000693	0.66	0.31
72	+.0350	−.2330	.2648	.003260	1.88	1.51
73	−.0572	−.2135	.1756	.000073	0.26	0.02
74	−.0687	−.1535	.1659	.000239	0.30	0.07
75	−.0443	−.1435	.1901	.000438	0.41	0.14
76	−.0582	−.1630	.1760	−.000137	0.20	−0.04
77	−.0730	−.1830	.1609	.000648	0.40	0.18
78	+.0055	−.1908	.2377	.001357	0.89	0.56
79	−.0084	−.1828	.2244	.000040	0.32	0.02
80	+.0080	−.2382	.2385	.000505	0.54	0.21
81	+.0320	−.2504	.2612	.000173	0.44	0.08
82	+.0183	−.2607	.2475	.000560	0.58	0.24
83	−.0082	−.2689	.2213	.001611	0.93	0.62
84	−.0376	−.2562	.1932	.000505	0.44	0.17
85	−.0410	−.2610	.1896	.001888	0.89	0.63
86	−.0492	−.2932	.1799	.001346	0.67	0.42
87	−.0264	−.3145	.2011	.000361	0.40	0.13
88	−.0664	−.3624	.1585	.000870	0.46	0.24
89	+.0227	−.3574	.2460	.001246	0.87	0.53
90	+.0071	−.3885	.2285	.001335	0.85	0.53
91	+.0128	−.4191	.2314	.000826	0.65	0.33
92	+.0220	−.4180	.2404	.000693	0.62	0.29
93	+.0413	−.4235	.2583	.000605	0.63	0.27
94	+.0797	−.4191	.2956	.001634	1.25	0.84
95	+.1040	−.4340	.3173	.002553	1.85	1.41
96	+.1393	−.4600	.3479	.002011	1.70	1.22
97	+.1330	−.4350	.3445	.001413	1.32	0.85
98	+.0981	−.4710	.3079	.000904	0.91	0.48
99	−.0100	−.4696	.2042	.001180	0.70	0.42
100	+.0113	−.4411	.2279	.003350	1.65	1.34
101	−.1929	−.9066	−.0846	.001717	−0.36	−0.25

YERKES PHOTOGRAPH NO. 1269 SMALL CRATERS

POINT	ξ	η	SIN ϕ	$\chi - \Delta\chi$	HEIGHT	ADJUSTED HEIGHT
102	-.0602	-.4192	.1600	.000748	0.43	0.21
103	-.0139	-.4170	.2056	.000693	0.53	0.25
104	-.0180	-.4286	.2006	.000250	0.36	0.09
105	-.0795	-.4808	.1346	.001568	0.56	0.37
107	+.0016	-.5354	.2077	.002077	1.04	0.75
108	-.0026	-.5542	.2011	.001070	0.65	0.37
109	+.0094	-.5934	.2070	.002620	1.24	0.95
110	+.1024	-.5923	.2961	.003363	2.15	1.74
111	+.0795	-.5783	.2766	.002222	1.45	1.07
112	+.1352	-.5954	.3263	.002842	2.07	1.62
113	+.1510	-.6082	.3390	.002433	1.91	1.44
114	+.1845	-.6011	.3710	.003850	3.01	2.49
115	+.1557	-.6465	.3366	.003020	2.24	1.77
116	+.0865	-.6665	.2682	.002765	1.67	1.30
117	+.0731	-.6922	.2503	.003209	1.75	1.40
118	+.0397	-.6975	.2174	.002965	1.43	1.13
119	+.0384	-.7182	.2116	.002711	1.30	1.00
120	+.0276	-.7130	.2024	.001802	0.92	0.64
121	+.0208	-.7066	.1972	.001027	0.63	0.35
122	+.0007	-.7134	.1763	.000761	0.48	0.23
123	+.1214	-.6911	.2960	.003386	2.16	1.75
124	+.0886	-.7297	.2567	.001204	0.89	0.54
125	+.0587	-.7246	.2296	.002910	1.49	1.17
126	+.0490	-.7240	.2204	.001847·	1.02	0.71
127	+.0382	-.7404	.2063	.001315	0.76	0.47
128	+.1314	-.7652	.2878	.001958	1.38	0.98
129	+.1337	-.7550	.2926	.001371	1.10	0.70
130	+.1366	-.7914	.2852	.003987	2.39	1.99
131	+.0404	-.7985	.1929	.006901	2.63	2.35
132	+.0621	-.7958	.2144	.003721	1.70	1.40
133	+.1404	-.8134	.2820	.003134	1.94	1.54
134	+.1163	-.8258	.2558	.003611	1.97	1.62
135	+.1035	-.8361	.2405	.001915	1.14	0.80
136	+.0583	-.8428	.1958	.001405	0.75	0.48
137	+.0925	-.8833	.2121	.003014	1.41	1.12
138	+.0930	-.8800	.2140	.001572	0.88	0.59
139	+.1567	-.8791	.2723	.001406	1.04	0.67
140	+.0870	-.9275	.1851	.002472	1.06	0.80
141	+.0172	-.9302	.1180	.002682	0.72	0.57
142	+.0280	-.9357	.1251	.002472	0.72	0.54
143	+.1537	-.9332	.2410	.004869	2.40	2.06
144	+.1526	-.9374	.2373	.004503	2.21	1.87
145	+.1452	-.9556	.2172	.005149	2.27	1.97
146	+.2185	-.9555	.2748	.006128	3.34	2.96
147	+.1423	-.1287	.3696	.003404	2.71	2.20
148	+.1558	-.1193	.3823	.002807	2.40	1.87
149	-.1463	-.6322	.0460	.002776	0.30	0.23
150	-.1029	-.7694	.0601	.002035	0.30	0.22