Provisional elements of 14 new and 6 known variables of the δ Cephei type in the region of η Carinae, by *Ejnar Hertzsprung*.

Of the δ Cephei-variables, which I have found and examined at Johannesburg, only a part has as yet been published in this *Bulletin*. The remainder is contained in the following lines.

The J. D. hel. M. T. Grw. for 14 old plates, using the reductions to the sun valid for the centre of my plates (10^h45^m, $-59°.5$), are

plate no.	J. D. hel. M. T. Grw.	plate no.	J. D. hel. M. T. Grw.
	d		d
90	2419878·2700	244	2420991·2753
165	2420250·3005	247	2421010·2722
173	2420327·2476	254	2421035·2554
292 †)	2420574·3543	274	2421287·3297
202	2420605·2609	277	2421305·3149
204	2420623·2543	277 A	2421401·2431
242	2420963·3209	1018	2421722·2678

† The number of this plate is out of series.

The main results are given in the usual way in Table 1 *) while the more detailed shape of the lightcurves is presented in Table 2 and the accompanying diagrams **). Mean values joined by a bracket in Table 2 have been combined to a single point in the corresponding diagram. The total number of estimates used in the present note is 9215.

The individual variables give rise to the following remarks.

g. The variable was found near maximum on the 2 old plates 254 and 1018. The range is unusually great for a period of about 3 days. Mean error of a single observation ± $^s·11$.

h. This and the following star *i* belong to the faintest variables of the δ Cephei-type known, not situated in extragalactic star-clouds. If the magnitudes indicated are approximately correct and the absolute magnitudes about equal to those derived for bright variables of this class, then the distances of the stars *h* and *i* will be something like 20000 parsecs. The variable was found near maximum on the 2 old plates 173 ($^s·0$) and 277 A ($^s·1$).

i. The variable is on the Franklin-Adams plates so near to neighbouring stars, that the estimates are difficult and the range is rather uncertain.

AQ *Car*. The variable was found near maximum on the 2 old plates 202 ($-^s·4$) and 254 ($-^s·4$).

*) The reciprocal periods indicate the actual values used in calculating the phases.

**) Vertical lines have been drawn for each tenth of the period. The one indicating the phase zero has been a little elongated. The scale of ordinates is marked in tenths of a step and the zero point of the scale of steps is indicated by an elongated mark.

TABLE 1.

star	α (1875)	δ (1875)	C. P. D.	aproximate phgr. mag.	epoch of point on the ascending branch half way up J. D. hel. M. T. Grw.	period	m. e.	reciprocal period	range	number of plates	zero point J. D. 2420000	
											phase of point half way up	phase of maximum
	h m s	° ′		m	d	d	d	d⁻¹	s		P	P
g	10 7 21·8	−61 28·4		14	2423963·410	2·910867	±·000058	·343540	·93	346	·59	·635
h	10 15 15·0	−55 40·8		14½	3936·240	6·24545	±·0004	·160116	·87	328	·255	·32
i	10 16 34·6	−60 37·4		14½	3962·410	4·2356	±·0018	·2361	·51	344	·525	·63
A Q Cn	10 17 7·0	−60 26·6	−60° 1856 m 9·1	9·6	3964·190	9·7709	±·0009	·102345	·68	547	·715	·01
C S Cn	10 29 51·6	−57 22·6		13½	3973·700	6·66155	±·0004	·150115	·75	493	·512	·585
j	10 37 42·0	−60 30·8	−60° 2187 9·7	10·4	3991·260	2·87608		·347696	·30	397	·745	·85
k	10 39 59·0	−57 38·4		13½	3865·850	16·3339	±·003	·061222	·99	430	·675	·76
l	10 43 32·3	−59 59·8		13½	3983·290	5·66436	±·0003	·176542	·89	458	·218	·35
m	10 46 ·7	−57 55·7		12½	3990·850	13·4545		·07432	·86	449	·60	·80
n	10 48 56·8	−59 17·9		13	3938·630	23·246	±·007	·043018	·96	442	·432	·465
W Z Cn	10 50 21·0	−60 16·3	−60° 2386 9·5	10·2	3982·970	23·0035		·04347158	1·60	573	·146	·195
U Cn	10 52 44·0	−59 4·0	−59° 2888 7·9	7·7	3983·100	38·7397		·025813313	1·25	570	·817	·915
o	10 55 21·4	−60 19·3		13	3923·010	7·639	±·005	·1309	·73	374	·522	·62
p	10 56 7·3	−59 26·6		11½	3980·220	4·58612	±·00026	·218049	·61	542	·883	·00
q	10 56 29·3	−61 37·1		11	3963·340	10·3560	±·0013	·0965625	·43	545	·71	·93
E R Cn	11 4 19·0	−58 9·7	−58° 3216 7·7	7·5	3998·110	7·7156		·129608	·73	398	·187	·366
r	11 4 56·8	−60 10·1		13	3915·860	10·2735	±·0013	·0973375	·81	507	·16	·41
s	11 8 56·5	−59 22·3	−59° 3236 9·4	10·1	3985·029	10·7166	±·0014	·093313	·44	531	·855	·03
t	11 19 30·5	−60 2·9	−60° 2917 9·5	10·3	3946·610	5·3008	±·0005	·18865	·65	474	·528	·665
u	11 19 39·5	−60 41·0	−60° 2919 9·1	9·6	3995·049	3·20667		·31185	·30	467	·856	·07

CS *Car* = *B. A. N.* 56 *d*. This variable was reobserved owing to the interesting form of its lightcurve. It was estimated on the 14 old plates as follows: —, ·05, ·75, faint, ·8, ·25, ·2:, ·55, ·35, ·65, —, —, —, and ·2 steps. Mean error of a single observation ± s·14.

j. The star was found marked with an arrow on an enlargement made at the Union Observatory, where its variability therefore has evidently been noted or at least suspected at an earlier date. The variable was found relatively bright on the 3 old plates 242, 277 and 1018. Mean error of a single observation ± s·076.

k = Harvard 1225. The variable was found near maximum on the old plate 277 A (s·0).

l. The variable was found near maximum on the 4 old plates 292 (s·1), 247 (s·0), 274 (s·0) and 277 A (s·0). Mean error of a single observation ± s·14.

m. The variable was found near minimum on the old plate 173 (1s·3).

n. The variable was found near maximum on the 2 old plates 242 and 254. The star looks double. The presence of a companion would make the minimum too bright and too flat.

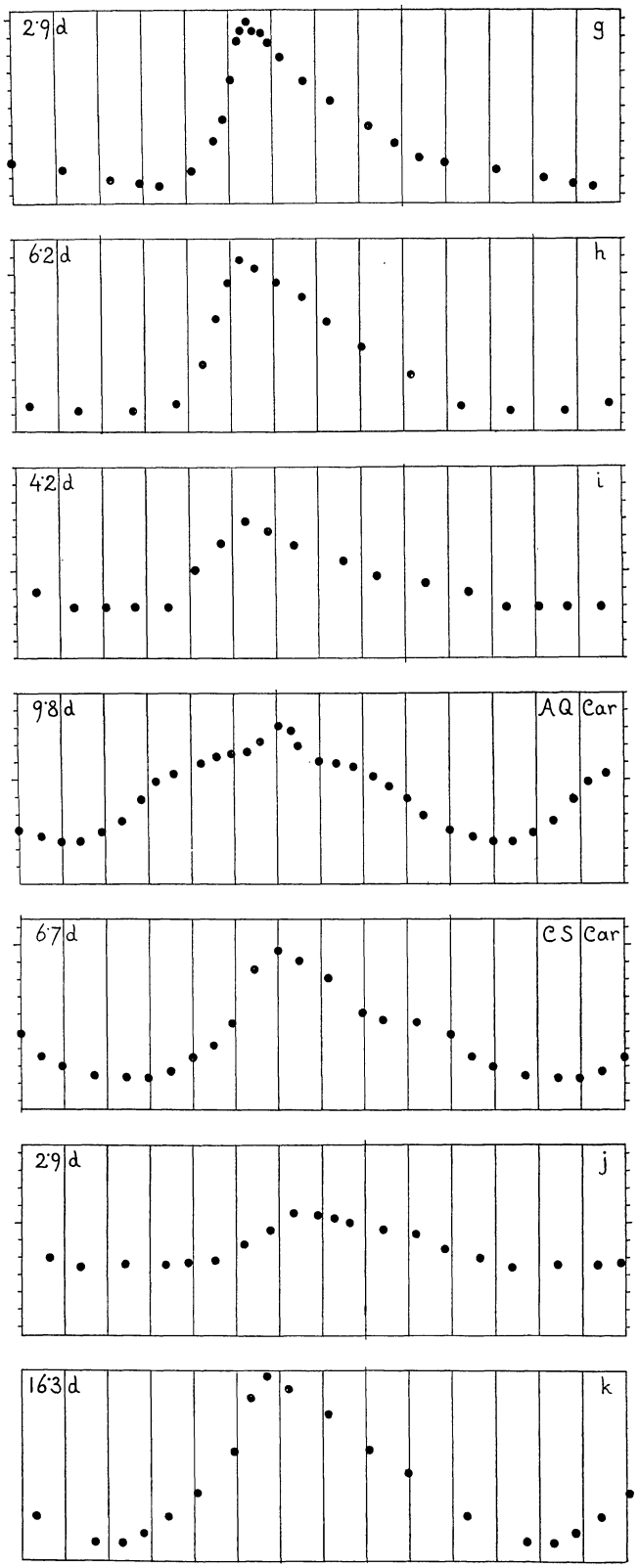
WZ *Car*. The unusual form of the lightcurve of the variable *n*, the rise to maximum being very steep and the minimum unusually flat, led me to observe WZ Car, the period of which (23d·0) is similar to that of *n* (23d·2). In fact, the general character of the two lightcurves proved to be the same in marked difference to all other variables of the δ Cephei-type so far examined. On the other hand the lightcurves of WZ Car and *n* are rather similar to those of variables of the RR Lyrae type. The period of WZ Car is so nearly equal to 23d, that during the time covered by my plates practically only 23 points of the lightcurve are obtained. The form of the rising branch of the lightcurve is therefore not well known.

U *Car*. This variable was observed owing to its exceptionally long period. The star is too bright for accurate estimates as the available comparison stars conveniently near to the variable are evidently of whiter colour, causing a difference in the character of the images. The period given in Table 1 is that indicated by ROBERTS. Adding my own observations I find the corrected period to be 38d·750.

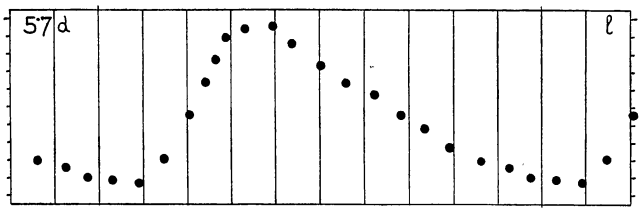
o. Mean error of a single observation ± s·09.

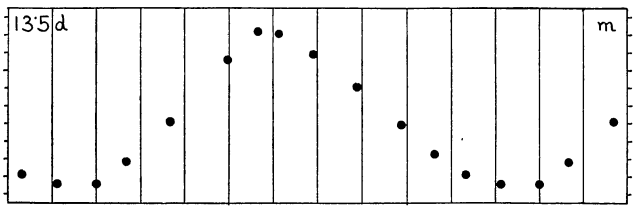
p. The variable was found near maximum on the 2 old plates 202 (s·19) and 242 (s·04).

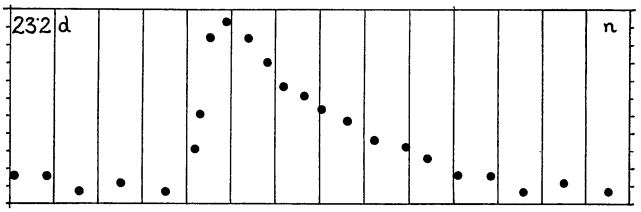
q. The estimates of the variable on the 14 old plates are respectively: ·05, — ·02, ·19, —, ·45, ·07, ·00, — ·08, ·18, — ·11, ·32, — ·04, ·36 and ·16 steps.

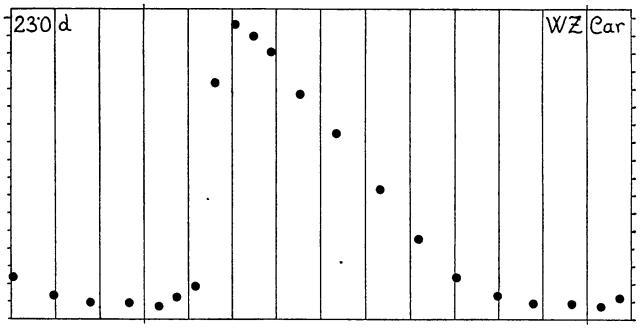


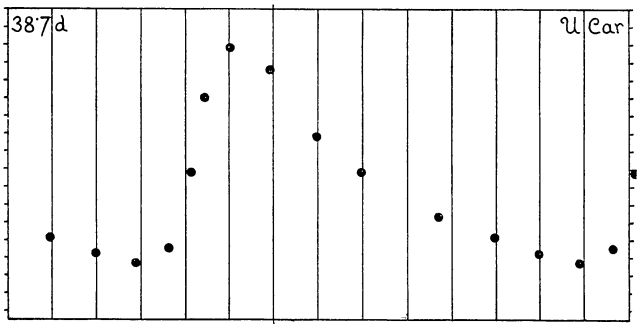
ER *Car* = *H.D.* 97082. In the Draper Catalogue the star is announced in a footnote as a variable of the δ Cephei-type. The star was found near maximum on the 3 old plates 90, 254 and 1018. The period

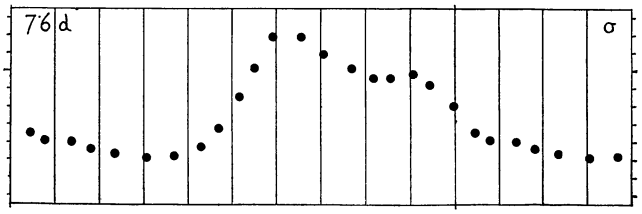


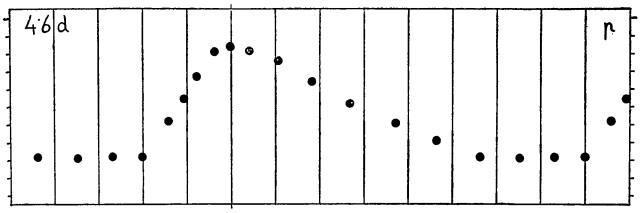


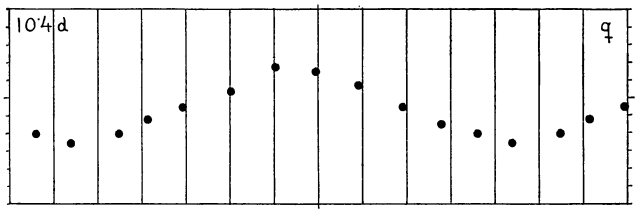


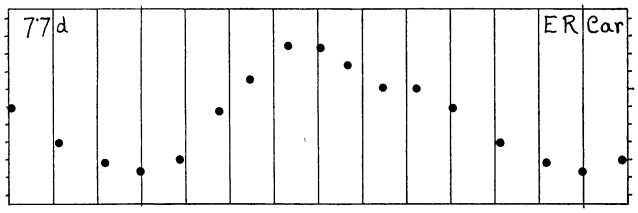


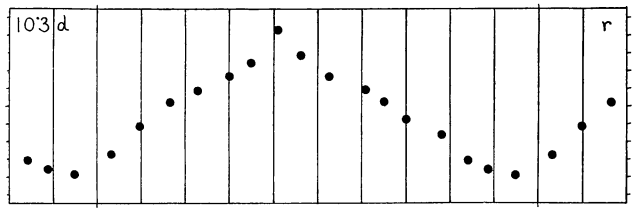


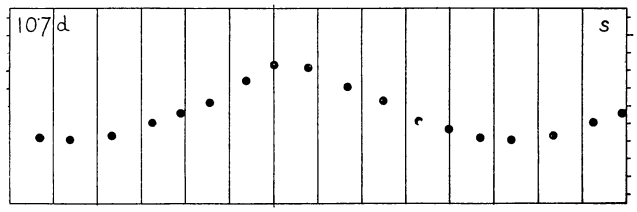


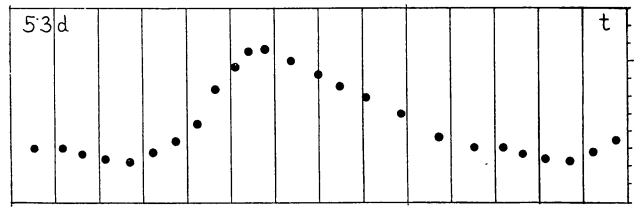


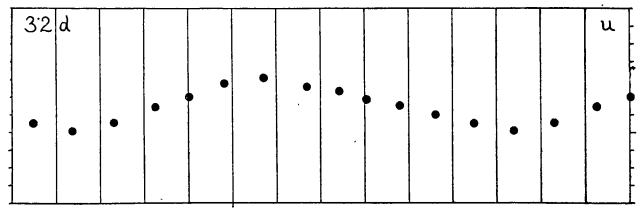












given in Table 1 has been found from recent plates only. Adding the 3 old maxima just mentioned the period derived is $7^{d}\cdot71886 \pm {}^{d}\cdot00064$ (m. e.). Mean error of a single observation $\pm {}^{s}\cdot11$.

r. The estimates on the 14 old plates are respectively —, ·32, ·76, —, 1·23, ·61, ·88, ·60, ·27, ·84, ·62, 1·15:, ·12 and ·60 steps.

s. The variable was found near minimum on the 6 old plates 90, 165, 173, 202, 244 and 254.

t. The estimates on the 14 old plates are respectively ·6, ·64, —·08, —, —, —, —, —·04, ·47, ·2, ·52, —·16, ·62, ·62 and ·0 steps. Mean error of a single observation ± s·12.

u. The variable was found near maximum on the 2 old plates 173 and 244. Mean error of a single observation ± s·082.

The area of 100 square degrees covered by my plates of the η Carinae region contains about 12800 stars of the *C. P. D.* Of this number so far 20 have been found to be variables of the eclipsing type and 18 of the δ Cephei-type.

TABLE 2.

g

n	P	s
30	·039	·788
30	·099	·818
30	·215	·860
30	·325	·918
30	·393	·938
20	·439	·954
10	·513	·870
10	·564	·698
5	·585	·574
6	·603	·347
4	·618	·128
5	·626	·068
6	·641	·018
10	·655	·067
10	·674	·081
10	·690	·136
20	·719	·220
20	·772	·353
20	·834	·464
20	·922	·612
20	·982	·704

h

30	·072	·785
20	·172	·742
20	·235	·520
10	·266	·260
10	·292	·050
10	·321	—·080
20	·357	—·030
20	·406	·049
20	·467	·130
20	·522	·275
40	·604	·421
40	·717	·576
30	·832	·755
38	·946	·783

i

34	·048	·071
30	·146	·123
30	·233	·208
20	·307	·205
20	·373	·205
20	·450	·208
10	·513	—·005
20	·574	—·160
20	·630	—·288
30	·683	—·227
30	·745	—·147
40	·857	—·054
40	·935	·026

A Q Car

n	P	s
17	·004	—·309
20	·033	—·285
10	·049	—·195
20	·098	—·108
20	·138	—·095
20	·176	—·075
20	·223	—·018
20	·260	·038
30	·302	·110
20	·339	·208
30	·400	·293
30	·452	·327
30	·498	·357
30	·544	·358
20	·591	·302
20	·639	·240
20	·684	·115
30	·718	·012
30	·759	—·035
30	·822	—·092
30	·858	—·133
20	·894	—·150
20	·931	—·160
10	·961	—·220

C S Car

19	·000	·516
26	·048	·648
34	·096	·701
33	·151	·764)
23	·200	·744)
30	·246	·766
26	·297	·770
30	·348	·733
13	·400	·650
34	·447	·583
25	·493	·452
23	·545	·142
24	·601	·032
15	·648	·091
30	·695	·121)
21	·747	·294)
15	·796	·393
18	·844	·431
27	·897	·403)
27	·947	·496)

j

n	P	s
30	·042	·043
30	·117	·068
30	·184	·152
30	·265	·202
30	·339	·254
30	·443	·243
27	·536	·244
30	·589	·234
30	·652	·219
20	·718	·124
20	·780	·044
20	·834	—·056
20	·889	—·042
20	·928	—·024
30	·964	·001

k

40	·006	·509
40	·097	·646
40	·234	·893
40	·370	1·043
40	·432	1·048
40	·482	·989
40	·541	·894
30	·607	·758
20	·693	·521
20	·731	·211
20	·769	·079
20	·820	·155
40	·912	·302

l

18	·031	·914
30	·090	·927
21	·146	·797
34	·205	·546
17	·241	·362
11	·264	·235
9	·288	·111
34	·332	·056
18	·395	·043
25	·438	·145
34	·502	·269
22	·557	·364
28	·622	·428
20	·681	·544
23	·734	·622
23	·790	·727
36	·860	·806
34	·925	·845
21	·974	·900

m

n	P	s
40	·086	·807
32	·163	·974
26	·233	1·089
27	·312	1·142
45	·401	1·145
36	·467	1·020
69	·567	·790
40	·697	·443
29	·765	·283
38	·814	·292
30	·891	·412
37	·989	·598

n

39	·009	·941
33	·083	·942
42	·156	1·033
44	·250	·986
38	·352	1·032
5	·416	·790
5	·430	·590
14	·452	·157
18	·489	·072
17	·539	·162
15	·582	·297
13	·617	·435
21	·665	·488
25	·704	·562
27	·761	·629
31	·821	·742
30	·891	·777
25	·940	·842

W Z Car

22	·033	1·627
12	·073	1·578
16	·116	1·516
17	·161	·371
11	·206	·038
29	·249	·104
23	·289	·193
31	·335	·345)
25	·379	·532)
30	·423	·584)
12	·464	·820)
36	·511	·908)
36	·555	1·026)
31	·599	1·165)
27	·641	1·348)
29	·684	1·428)
24	·728	1·502)
33	·774	1·547)
33	·818	1·589)
26	·858	1·604)
25	·901	1·617)
23	·944	1·598)
22	·988	1·629)

U Car

n	P	s
60	·098	·819
50	·197	1·018
80	·369	1·272
80	·495	1·388
80	·598	1·478
50	·689	1·535
30	·764	1·451
30	·812	1·023
30	·843	·601
40	·902	·321
40	·993	·439

o

17	·045	·35
17	·078	·39
20	·139	·40
20	·181	·44
19	·235	·47
20	·305	·49
23	·369	·48
20	·429	·43
12	·470	·325
15	·515	·15
7	·551	—·01
22	·593	—·19
21	·657	—·19
20	·706	—·09
20	·768	—·01
20	·817	·045
20	·855	·045
20	·905	·02
25	·942	·08
11	·996	·20

p

20	·041	·187
50	·106	·244
50	·182	·362
50	·267	·485
50	·371	·597
50	·464	·692
50	·563	·784
40	·652	·789
40	·731	·784
40	·799	·784
20	·857	·581
20	·892	·454
20	·921	·330
21	·964	·194
21	·998	·163

q

n	P	s
49	·091	—·067
50	‘192	·052
50	·279	·151
50	·360	·205
50	·439	·256
41	·547	·203
45	·614	·125
49	·692	·053
48	·802	— 033
60	·903	—·174
53	·995	—·146

E R Car

n	P	s
30	·087	·402
30	·177	·126
30	·247	—·058
30	·334	—·247
30	·407	—·230
30	·466	—·135
30	·546	—·007
30	·621	—·001
30	·705	·110
30	·780	·294)
30	·845	·321)
30	·917	·422
38	·997	·473

r

30	·031	·876
30	·098	·714
30	·165	·578
40	·228	·513
30	·300	·430
30	·349	·356
30	·408	·173
30	·463	·314
40	·535	·434
30	·608	·509
30	·651	·576
30	·700	·674
30	·780	·762
30	·842	·907
30	·886	·957
37	·949	·991

s

n	P	s
41	·000	·169
40	·078	·186
40	·167	·292
50	·249	·369
40	·331	·488
40	·397	·532
40	·468	·579
40	·539	·592
40	·634	·570
40	·725	·495
40	·790	·440
40	·855	·381
40	·937	·260

t

30	·073	·433
30	·154	·492
30	·218	·498
30	·263	·527
30	·315	·558
30	·370	·573
30	·423	·520
20	·475	·452
16	·524	·357
18	·565	·157
20	·612	·033
20	·643	—·054
20	·679	—·070
30	·737	—·001
30	·800	·076
30	·848	·144
30	·908	·205
30	·987	·299

u

30	·072	—·309
40	·168	—·256
40	·242	—·230
40	·305	—·184
40	·380	—·149
40	·461	—·100
40	·549	—·051
40	·637	—·008
40	·731	—·054
40	·826	—·142
40	·902	—·200
37	·983	—·276