ANNALS OF THE DEARBORN OBSERVATORY
OF NORTHWESTERN UNIVERSITY

Vol. V Part 7

Carbon Stars in Zones +40° to +90°
Dearborn Survey of Faint Red Stars

Oliver J. Lee, Greenville D. Gore and Thomas J. Bartlett

This report is a continuation of our Annals Vol. IV, Part 16 and Vol. V, Part 3 and completes our survey to the north pole. As in former cases, we have now abstracted the carbon stars from Vol. V, Part 1 C, for the convenience of investigators of these stars and have made Table 1. Re-observation of 61 known R and N stars and 71 discoveries by us in these zones, are listed.

TABLE 1. R and N Stars in Dearborn Zones, +40° to +90°.

No.	Right Ascension (1900)	Declination (1900)	m	D.O. Type	Sanford Type	Galactic	
						Long.	Lat.
234	0h 02m.1	+43° 22'	10.1	R		83°	-18°
235	0 12.2	49 44	9.1	R	N	87	-13
236	0 14.6	44 09	7.6	N	N	85	-18
237	0 17.0	58 39	9.6	N	N	88	0
238	0 19.1	53 44	9.5	R	R6	87	-15
239	0 30.0	70 00	9.5	R		89	+ 8
240	0 56.5	61 19	10.6	R		92	- 1
241	1h 05.1	53 11	9.8	N	Ne	93	- 9
242	1 23.1	58 23	10.7	R		95	- 4
243	1 27.0	57 14	9.8	N	N	98	- 4
244	1 38.8	53 28	10.0	R	R6	99	- 8
245	1 49.6	58 46	10.2	N?	Ne	99	- 1
246	2h 15.7	49 39	10.7	N		106	- 9
247	2 16.7	48 17	11.0	N?		107	-11
248	2 20.3	51 43	9.6	N	N	105	- 7
249	2 24.4	48 22	11.1	N		107	-11
250	2 31.3	55 20	11.0	R	R4	105	- 4
251	2 39.3	46 42	10.1	R		111	-10
252	2 45.7	54 03	12.3	N		105	- 3
253	2 50.1	47 30	10.5	R		111	-10
254	3h 3.0	45 35	10.9	N		114	-11
255	3 03.8	57 30	7.6	R	R6	108	0
256	3 06.7	47 26	9.1	R	Np	114	- 9
257	3 09.0	57 57	12	N		109	0
258	3 17.8	51 15	(12.7)	N?		114	- 4
259	3 19.6	47 11	12.2	N		116	- 6
260	3 21.0	43 50	8.1	R	R4e	117	- 9
261	3 24.0	44 15	10.8	R		118	- 8
262	3 25.5	52 22	11.1	R		113	- 2
263	3 25.8	41 04	12.0	N		120	- 9

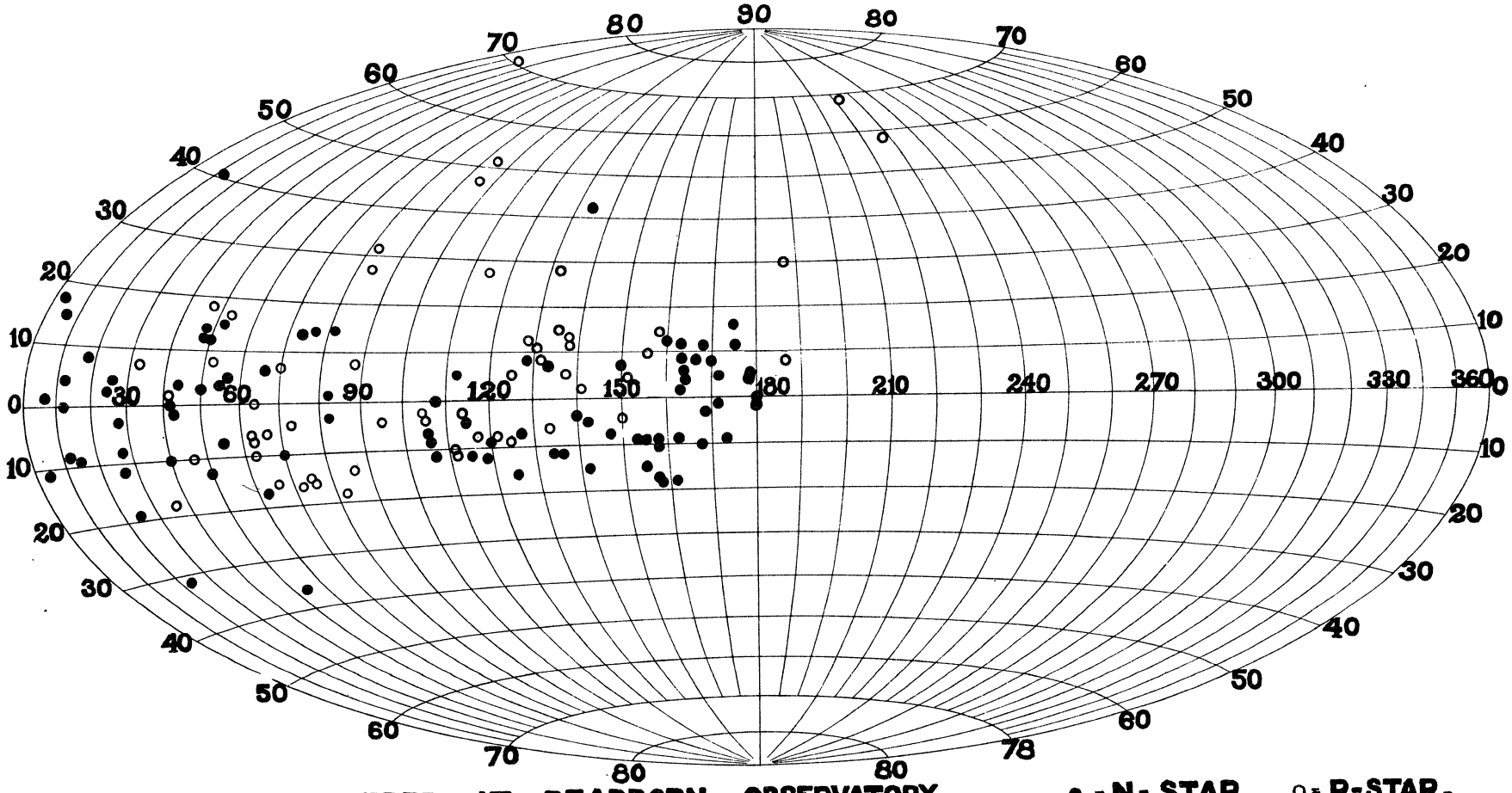
TABLE 1. R and N Stars in Dearborn Zones, +40° to +90°. (Continued)

No.	Right Ascension (1900)	Declination (1900)	m	D.O. Type	Sanford Type	Galactic	
						Long.	Lat
264	3h 32m.7	+62° 18'	7.3	N	N	109°	+ 7°
265	3 34.3	51 11	8.4	N	N	118	- 1
266	3 38.0	44 30	10.0	R	N	120	- 6
267	3 45.3	43 28	10.5	R		121	- 7
268	3 46.0	41 24	11.3	R		125	- 9
269	3 49.4	43 32	10.4	R		122	- 7
270	3 51.0	59 42	11.4	N		112	+ 6
271	3 52.5	46 10	12.0	N		120	- 5
272	3h 57.3	61 31	7.8	R	R8	112	+ 8
273	4h 03.6	44 14	11.8	N		123	- 4
274	4h 13.0	40 52	11.1	N	N	127	- 6
275	4 41.0	68 02	6.2	N	N	126	+10
276	4 46.6	49 47	10.5	R	Ne	124	+ 5
277	4 55.6	50 30	8.1	N	N	126	+ 7
278	4h 56.2	47 59	11.2	R		125	+ 6
279	5h 18.1	49 01	10.9	N		129	+ 9
280	5 22.0	43 19	9.9	R	N	132	+ 6
281	5 30.5	68 47	9.3	N	R8e	113	+20
282	5 30.9	45 35	11.4	R		131	+ 9
283	5 36.8	47 08	11.1	N		131	+ 9
284	5h 40.1	50 21	11.2	R		129	+12
285	5 41.4	44 55	9.9	N	N	134	+10
286	5 44.4	48 25	10.7	R		130	+11
287	5h 57.0	47 18	10.9	N	N	134	+14
288	6h 14.7	46 06	11.4	R		136	+16
289	6 16.6	47 44	9.8	R	Ne	134	+17
290	6 27.6	42 35	8.4	R		140	+19
291	6h 55.4	68 20	11.3	R		115	+27
292	7h 11.0	69 50	8.6	R	K0-R0	113	+29
293	7 27.7	51 43	10.0	R		133	+29
294	8h 50.8	51 48	9.1	R	R4	134	+40
295	8h 56.2	50 29	9.6	R	R6	137	+40
296	9h 11.4	51 50	9.8	N		135	+42
297	9h 44.3	53 05	10.2	R	R3	131	+48
298	10h 08.5	77 40	11.2	R	R6	100	+38
299	10h 38.1	67 56	7.1	N	N	106	+47
300	11h 58.5	71 00	9.6	R		95	+47
301	12h 40.4	45 59	6.2	R	N	90	+72
302	12h 52.6	66 33	8.0	N	N	89	+50
303	15h 26.6	65 42	9.9	R		95	+52
304	15h 31.0	80 22	11.6	R		82	+35
305	17h 10.2	42 12	7.9	R	R0	33	+36
306	17h 54.9	58 11	8.9	N	Ne	54	+29
307	18h 52.1	49 30	10.5	R		47	+18
308	19h 21.5	49 53	11.1	N		49	+15
309	19 25.0	76 23	6.5	N	N	75	+25
310	19 25.9	45 49	8.1	N	N	46	+13
311	19 27.3	48 49	11.1	N		49	+13
312	19 28.9	49 22	10.7	N		50	+13
313	19 29.3	51 13	11.5	N		51	+16

TABLE 1. R and N Stars in Dearborn Zones, +40° to +90°. (Continued)

No.	Right Ascension (1900)	Declination (1900)	m	D.O. Type	Sanford Type	Galactic	
						Long.	Lat.
314	19h 30.m2	52° 16'	10.7	R		52°	+17°
315	19 42.0	85 05	10.1	R	R3	85	+26
316	19 45.0	85 10	(10)	R		85	+27
317	19h 54.0	44 01	8.1	N	N	47	+ 7
318	20h 00.7	47 53	11.3	R		51	+ 9
319	20 06.4	47 34	8.9	N	R3	50	+ 8
320	20 13.3	49 36	10.2	R		53	+ 8
321	20 16.5	47 32	9.9	N	Ne	51	+ 8
322	20 21.8	55 57	10.8	R	N	59	+11
323	20 22.7	69 26	12.0	R?		70	+17
324	20h 30.3	49 03	12.1	N?		53	+ 5
325	20 34.0	59 43	11.0	R		64	+12
326	20 34.6	48 36	11.6	N		55	+ 4
327	20 38.1	47 45	9.3	N	Ne	50	+ 3
328	20 43.9	49 45	(12.1)	R?		56	+ 4
329	20 45.1	51 12	(12:3)	R		57	+ 5
330	20 46.9	45 02	10.3	R	N	53	0
331	21 18.7	41 58	9.5	R	N	55	- 7
332	21 17.9	59 27	(12.3)	N		66	+ 7
333	21 25.6	69 48	(12.2)	N		75	+14
334	21 29.4	43 28	10.6	N		56	- 7
335	21 32.3	60 27	9.7	R	N	68	+ 6
336	21 36.0	78 10	8.9	N	Ne	80	+20
337	21 41.7	62 07	10.9	R		70	+ 7
338	21 43.8	73 10	10.4	N		78	+15
339	21 43.3	52 07	11.4	R		64	0
340	21 46.4	47 20	10.7	R		62	- 7
341	21 48.5	46 56	10.8	R		62	- 6
342	21 51.6	54 00	10.1	N		68	0
343	21 51.6	50 04	9.7	N	R3	68	0
344	21 58.3	43 06	11.3	R		62	-10
345	21 59.4	45 05	10.2	R	N	66	- 8
346	22 02.7	47 58	9.1	R		67	- 5
347	22 35.0	47 52	10.0	N		70	-10
348	22 40.6	61 15	8.3	N	N	76	+ 2
349	22 40.9	48 57	10.0	R	N	71	- 9
350	22 41.1	56 05	9.9	N?	N	74	- 3
351	22 42.0	74 18	11.4	N		81	+14
352	22 42.0	54 16	10	R	R6	73	- 4
353	22 42.3	40 32	(12)	R		66	-16
354	22 51.9	53 43	9.4	R	N	76	- 4
355	22 57.3	45 21	10.1	N	R8	72	-14
356	22 58.3	42 32	11.5	R		71	-16
357	23 06.1	45 46	10.1	R	R2	72	-15
358	23 15.3	46 43	10.6	R		76	-14
359	23 18.6	44 53	10.2	R		76	-15
360	23 18.7	55 36	9.7	N	R8	79	- 4
361	23 22.3	48 57	9.0	R?	N	77	-11
362	23 27.8	61 34	9.9	N		82	+ 1
363	23 38.6	57 37	11.1	N		82	- 3
364	23 54.0	56 26	8.8	R	Ne	82	- 8
365	23 59.5	42 59	8.5	R	N	82	-19

Note Astrophysical Journal Vol. 99, 1944.



CARBON STARS DISCOVERED AT DEARBORN OBSERVATORY. ● = N- STAR ○ = R-STAR.

FIGURE 1.

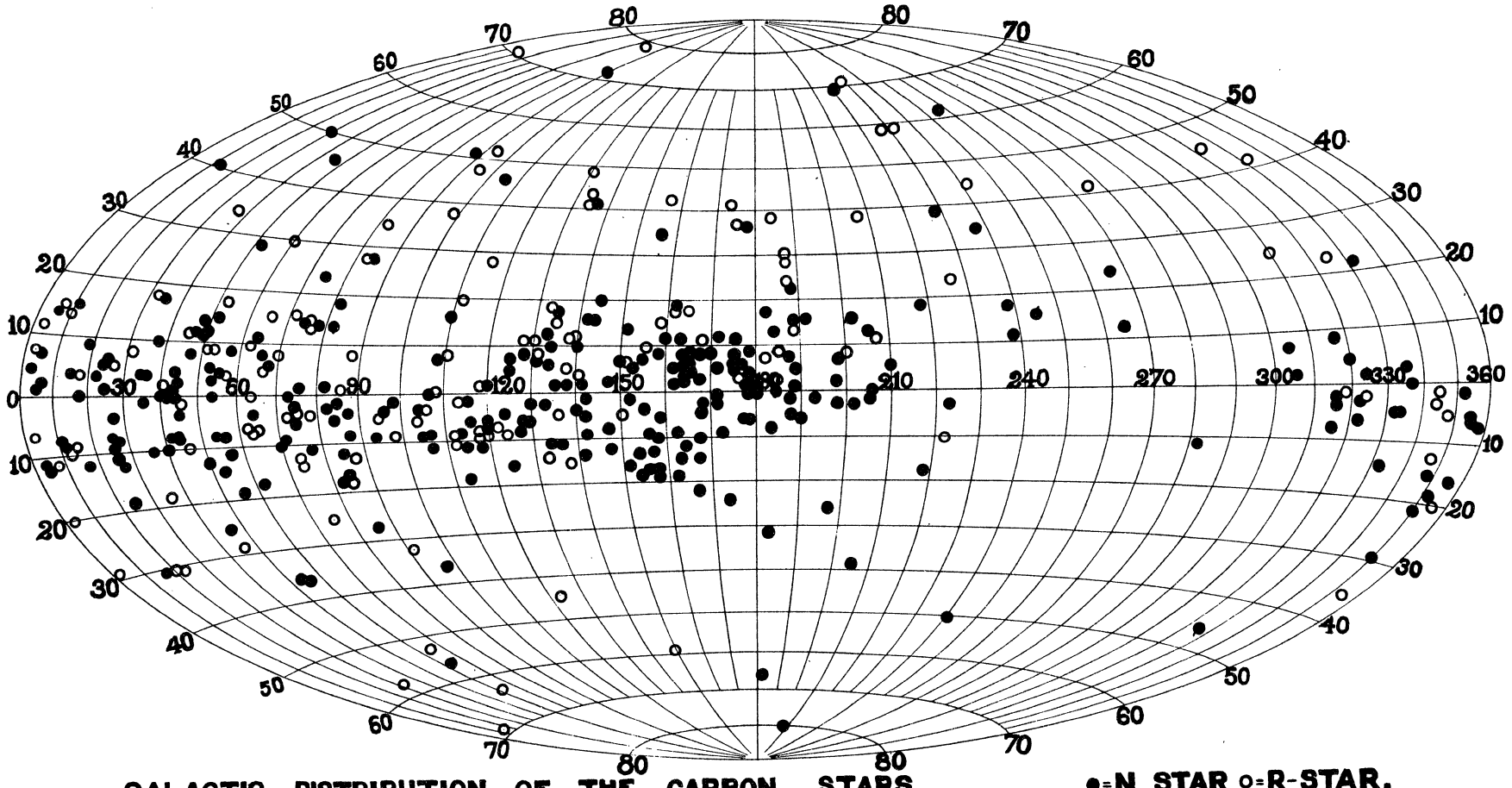


FIGURE 2.

Of the 209 carbon stars discovered in the course of our survey, we feel certain about 144 -- 89 are of type N and 55 of type R. They are shown in Figure 1.[1]

Figure 2[1] includes approximately all carbon stars now known, including those in Figure 1. There are 282 N and 136 R stars shown.

We note the following:

1. The nest of N stars around longitude 180°, which we first described in 1940, is also visible in Sanford's figures (Mount Wilson Contributions #689,1944). (The stars in his list average 9th magnitude at maximum.) It becomes pronounced when our stars (average magnitude nearly 11) are added.

2. Our figures show much greater galactic concentration of R stars. Curiously they avoid the N-star nest almost completely, but are quite well distributed elsewhere. This avoidance could be due to the presence of an obscuring cloud, because the N stars have a somewhat higher luminosity.

3. We have had some difficulty in deciding whether a very faint carbon star on our plates is of type N or R. The greater redness of the N stars has been our final criterion. This uncertainty, however, has been constant throughout our study, and it cannot in any way account for the peculiarities in distribution which we have noted.

At the meeting of Section D held in Cleveland in September, 1944, Lee and Bartlett concluded a report with the following statement and questions concerning the distribution of the carbon stars.

In view of the carefully accumulated evidence, which we must consider incontrovertible, such questions as the following inevitably arise.

a. Is it possible that our branch of the Milky Way has an especial abundance of carbon and its compounds, which characterize so markedly the atmospheres of the R and notably the N-type stars?

b. Is this due to quite irregular distribution of these cosmic materials, or does our part of galactic space have properties which tend to show them more favorably in star-building?

c. Is ours a somewhat recently developed galactic subdivision (or a very old one) in which stars are now racing through a brief "carbon phase" at high speed?

Now, more than two years later, and after completing our survey to the north pole, we have even more confidence in our observations, and still ask ourselves such questions.

[1] These figures were shown and discussed at the Madison meeting of the American Astronomical Society on September 9, 1946.