plet of $Fe\ I$, and of other strong lines from excited levels, suggests that the high pressures seriously shift and alter the atomic energy states.

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Hagen, John P., E. F. McClain and Nannielou Hepburn. Radio discrete sources and galactic absorption at 21 cm wave length.

Observations have been made of twenty sources of 21 cm continuous radiation, and in several cases there is clear evidence of absorption of the neutral hydrogen radiation by the region identified as the radio source. Our program has been to study several selected regions in the sky and determine the spectrum with the hydrogen line equipment, the angular dimension of the region, and the relative brightness of the region in the continuous background. The 21 cm receiver installed in the 50-foot radio telescope uses two channels, one approximately 1.9 mc wide which is normally used as a comparison channel and a second one 55 kc wide which is tuned to the hydrogen radiation whose frequency in the absence of doppler shift is 1420.405 mc. These two channels are separated by 3.25 mc. In the experiments reported here a measurement was made of the hydrogen line radiation by observing the difference between the broad and narrow channels, and in addition the background signal was simultaneously measured in the broad channel alone. The broad channel corresponds to a conventional radiometer when used in this way.

The table lists the 21 cm sources in the order in which they were observed at this wave length.

TABLE I. SOURCES OBSERVED AT 21 CM WAVE LENGTH

No.	Source	R.A.	Dec.	$T_a^{\circ}K$	Flux†
1	Cas	23 ^h 21 ^m	+58° 32'	115	266
2	Tau	5 31	+22 30	46	106
3	Cyg A	19 58	+40 30	63	146
4	M17	18 17	-16 00	35	82
5	NRL No. 5	17 43	-28 45	73	170
6	Ori	5 32	- 5 20	18	42
7	Cen	13 22	-42 40	17	40
8	Vir	12 27	+12 20	13	30
9	NRL No. 9	17 43	-28 45	6	
10	M20	17 57	-23 03	18	42
11	Cyg X	20 40	+40 40	16	
12*	NGC 6604	18 16	-12 10	4	9
13.	IC 443	6 13	+22 40	7	16
14*	M16	18 17	-13 40	9	21
15	S78	20 22	+40 20	15	34
16	NGC 7000	20 53	+44 30	4	
17*	S79	20 30	+43 45	3	7
18*	Ori B	5 39	- 1 30	2	5
19*	S45	18 24	-12 30	11	26
20	Aql	18 59	+ 5	4	9

* New source.

† Unit = $10^{-26} \text{ w m}^{-2} \text{ c}^{-1} \text{ sec}^{-1}$.

Fourteen of these sources were seen for the first time at 21 cm and seven of the sources are being reported for the first time.¹ The temperatures and fluxes are believed to have a probable error of +20 per cent to -15 per cent, and the positions to be accurate within $\pm 15'$, depending on the strength of the source. Of special interest are the ten $H\ II$ regions, which were located by using the optical positions of known $H\ II$ regions as a guide in searching for the radiation at 21 cm. Five of these are new sources and are indicated by an asterisk in the first column of the table. Sources NRL Nos. 5 and 9, listed by Haddock, Mayer, and Sloanaker at 9.4 cm,² were found to be of surprising interest at 21 cm.

At the position of the radio sources the receiver was tuned to a peak in the hydrogen spectrum and the antenna swept in hour angle or declination through the position of the source. At the position of source NRL No. 5 an outstanding case of absorption of the neutral hydrogen radiation by the radio source was discovered.³ A similar but less striking case of absorption occurs in the region of the Crab Nebula. The diameter of source No. 5 lies between $\frac{1}{2}^{\circ}$ and $1\frac{1}{2}^{\circ}$, and it is superposed on the much wider source No. 9. The absorption of the hydrogen radiation amounts to 50 per cent, so that the source must be quite opaque and most of the neutral hydrogen must be behind the source.

The position of source No. 5, R.A. 17^h43^m, Dec. -28°45', is in the bright star cloud in Sagittarius, and it is interesting to speculate that the narrow hot peak in the background emission corresponds to the dense core of the nucleus of our galaxy where there may be little hydrogen. The neutral hydrogen which is absorbed must come from hydrogen clouds beyond the nucleus, but since there is little Doppler shift in the line radiation it is impossible to infer distance.

1. *Proc. Inst. Radio Eng.* (in press).

2. *Ap. J.* 119, 456, 1954.

3. *Ap. J.* (in press).

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Hardie, Robert. Photometry with the Lowell 20-inch telescope.

Photoelectric observations of a number of faint objects were undertaken recently using the 20-inch reflector of the Lowell Observatory. The equipment used consisted of a photomultiplier of high sensitivity kindly furnished by A. Lallemand of the Paris Observatory which was employed unrefrigerated, and an AC amplifier built