which the line is observed, respectively, to appear, to reach maximum, and to disappear. Asterisks in the last column denote the ultimate lines of the neutral atom, which are strongest

TABLE XXVII

Atom	Series	Line	Classes	Atom	Series	Line	Classes
1 H	1S – 2P	4340	– A3 –	22 Ti	1F – F	3999	* * A2
2 He	$1^2P - 3^2D$	4471	B9 B3 O		1F – G	4862	* * A2
	1S – 2P	5015	B9 B3 O			4867	* * A2
	1P – 4D	4388	B9 B3 O			4856	* * A2
He+	4F – 9G	4542	O O –		$1^5F - {}^5F$	4536	– – A5
3 Li	$1^2S - 1^2P$	6707	* * –			4535	– – A5
6 C+	$2^2D - 3^2F$	4267	B9 B3 O	23 V	$1^6G - {}^6G$	4333	* * Fo
11 Na	$1^2S - 1^2P$	5889	* * Ao‡			4330	* * Fo
		5896	* * Ao‡	24 Cr	$1^7S - 1^7P$	4290	* * A2
12 Mg	$1^3P - 1^3D$	5184	– ? Ao‡			4275	* * A2
		5173	– ? Ao‡			4254	* * A2
		5167	– ? Ao‡		$1^5S - 1^5P$	4497	– M1 A7
	$1^3P - 2^3D$	3838	– ? Ao	25 Mn	$1^6S - 1^6P$	4034	* * A2
		3832	– ? Ao			4033	* * A2
		3829	– ? Ao			4030	* * A2
Mg+	$2^2D - 3^2F$	4481	– A3 Bo		$1^6D - {}^6D$	4084	– K2 A3
13 Al	$1^2P - 1^2S$	3962	* * Ao			4041	– K2 A3
		3944	* * Ao	26 Fe	$1^3F - {}^3G$	4325	– K2 A2
14 Si		3905	– Go A2		$1^3F - {}^3F$	4072	– Ko Ao
Si+		4128	Fo Ao O	30 Zn	$1^3P - 1^3S$	4811	G5 Go A7†
		4131	Fo Ao O			4722	G5 Go A7†
19 K	$1^2S - 1^2P$	4044	* * F8	38 Sr	1S – 1P	4607	* * Fo
		4047	* * F8	Sr+	$1^2S - 1^2D$	4078	– K2 Ao
20 Ca	1S – 1P	4227	* * B9	54 Ba+	$1^2S - 1^2P$	4555	– ? A2
	$1^3P - 2^3D$	4455	– K2 Fo				
Ca+	$1^2S - 1^2P$	3933	– –Bo				

at low temperatures, and have no maximum. Estimates by Menzel are indicated by a dagger; those marked by a double dagger were taken from dyed plates made with slightly smaller dispersion.

Method of Estimating Relative Abundances

If the physical conception of marginal appearance above outlined is correct, the *number of atoms* of a given kind above the photosphere will practically determine the class at which the corresponding line is last seen.[5] Now at marginal appearance the number of suitable atoms is only a small fraction of the total amount of the corresponding element that is present in the reversing layer, and this fraction is precisely the " fractional concentration " evaluated by Fowler and Milne. If then it be assumed that the number of atoms required for marginal appearance is the same for all elements, the reciprocals of the computed fractional concentrations at marginal appearance should give directly the relative abundances of the atoms.

A few remarks concerning the underlying assumptions may be appropriate. In applying the theory it is assumed that stellar atmospheres are of uniform composition, and that at marginal appearance all lines are unsaturated. These reasonable assumptions have been discussed above, and they are here explicitly restated. The third assumption, that the same number of atoms is represented at the marginal appearance of a line, whatever the element, is by far the most serious. It implies the equality of the absorbing efficiencies of the individual atoms under the conditions involved. This is assumed in default of a suitable correction, but it is not suggested that the use here made of the assumption would imply its universal validity. Its present application is made under conditions of extremely low pressure (1.31×10^{-4} atmospheres), and over a range of temperature from 7000° to 10,000°. Under such conditions the absorbing efficiency of an atom will depend almost entirely upon its energy supply and upon its inherent tendency to recover after undergoing an electron transfer. The pressures are so low that collisions will have no appreciable effect in disturbing the normal recovery of the atoms. The energy supply will vary with the temperature; but with the range of temperature considered the

[5] Payne, Proc. N. Ac. Sci., 11, 192, 1925.