

ume, and low density. The last feature furnishes an interpretation of the spectral peculiarities (see Chapter X).

The reality of the c-character has been questioned owing to a misapprehension as to its criteria.³⁷ Fine lines always accompany the c-character, but they may be present without it. The star η Ursae Majoris is a case in point. It is listed in the Henry Draper Catalogue as having narrow lines, a remark that usually indicates the presence of the c-character. Actually the star appears to be a dwarf, of Class Fo, with considerable proper motion. Although the lines are narrow and sharp, the spectrum has not the very typical appearance of a c-star.

³⁷ Harper and Young, *J. R. A. S. Can.*, 18, 9, 1924.

CHAPTER XIII

THE RELATIVE ABUNDANCE OF THE ELEMENTS

THE relative frequency of atomic species has for some time been of recognized significance. Numerous deductions have been based upon the observed terrestrial distribution of the elements; for example, attention has been drawn to the preponderance of the lighter elements (comprising those of atomic number less than thirty), to the "law of even numbers," which states that elements of even atomic number are far more frequent than elements of odd atomic number, and to the high frequency of atoms with an atomic weight that is a multiple of four.

The existence of these general relations for the atoms that occur in the crust of the earth is in itself a fact of the highest interest, but the considerations contained in the present chapter indicate that such relations also hold for the atoms that constitute the stellar atmospheres and therefore have an even deeper significance than was at first supposed. Data on the subject of the relative frequency of the different species of atoms contain a possible key to the problem of the evolution and stability of the elements. Though the time does not as yet seem ripe for an interpretation of the facts, the collection of data on a comprehensive scale will prepare the way for theory, and will help to place it, when it comes, on a sound observational basis.

The intensity of the absorption lines associated with an element immediately suggests itself as a possible source of information on relative abundance. But the same species of atom gives rise simultaneously to lines of different intensities belonging to the same series, and also to different series, which change in intensity relative to one another according to the temperature of the star. The intensity of the absorption line is, of course, a very complex function of the temperature, the pressure, and the