resulting in two excited states of ^{24}Mg. These go over either to the ground state or to lower excited states with the emission of gamma-rays.

(2) The change in angular momentum due to the beta-ray emission is $\Delta i = 1$ for the transition corresponding to the higher energy group, $\Delta i = 0$ for the lower one and $\Delta i \geqq 3$ for any other transitions.

(3) Moreover, the ground state of ^{24}Mg has zero spin since the nucleus contains $4n$ particles.

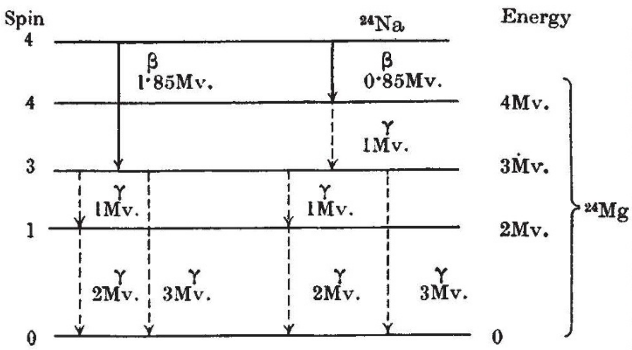
Now, according to Bethe[4], the probability of emission of multipole radiation of order Δi is given by the following formula:

$$\frac{1}{\tau} = \frac{1}{5 \times 10^{-21} \, (\Delta i\,!)^2 \, (20/\hbar\omega)^{2\Delta i + 1}} \text{ sec.}^{-1},$$

where $\hbar\omega$ is the energy of gamma-rays in Mv. and Δi is the change in angular momentum during the process of emission.

Taking the intensity ratio of the two beta-rays groups into account, we can calculate the relative intensities of the gamma-rays by means of this formula, and compare them with the observed values of Kurie and Richardson.

Of the level schemes which have been studied for the cases having two and three excited states, only the one shown in the accompanying diagram satisfies the observed intensity relations of the gamma-rays.



Level Scheme of ^{24}Mg.

The relative intensities of the gamma-rays calculated for this level scheme are as follows:

1 Mv.	2 Mv.	3 Mv.
1·26	0·86	0·52

These figures agree with Kurie and Richardson's values within their limit of experimental error of 20 per cent. All the other level schemes give intensity ratios that deviate greatly from the observed values.

It is probable that there exists some uncertainty in the determination of the intensity ratio of the two beta-ray groups, and the above value (2·3) may be under-estimated. This, however, does not materially affect the above conclusion.

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CN Bands in the Night Sky Spectrum

In August 1933, at the Pic du Midi, we photographed the spectrum of the night sky simultaneously at the horizon and at the zenith. On each of the four spectrograms so obtained, we noticed that the Vegard-Kaplan bands of molecular nitrogen weaken at the zenith and that new radiations can be distinctly seen in their place. For example, the (3 → 15) λ 4531 Vegard-Kaplan band, strong and broad at the horizon, disappears almost completely at the zenith; while, at λλ 4554 and 4576, we observed radiations the intensity of which remained constant. So we were led to draw up a list, including about thirty radiations the intensity of which does not vary obviously from the zenith to the horizon.

The probable presence of the CH bands in the sky spectrum and the analogy of the latter with cometary spectra led us to search in the preceding list for other band-systems associated with carbon. Let us examine the CN case. The 4554 and 4576 sky radiations can be identified with the R and P branches of the 1 → 3 band in the CN violet spectrum. But in order to justify this identification we must find in the list the other CN bands. Indeed we observe the bands of the same sequence: R (5 → 7) near λ 4480, R and P (4 → 6) near λ 4499, R and P (3 → 5) near λ 4517; we notice also the R (3 → 4), R (2 → 3) and P (3 → 4), R and P (1 → 2), R and P (0 → 1) bands.

In order to go further, we must give up this list, obtained from only four spectrograms and consequently a little brief, and use the tables of wave-lengths which result from all the observations we have made since 1933. Kaplan has already found a good concordance between the wave-lengths given by Gauzit and those of the 'tail' bands[1].

But before considering the bands with high vibrational quantum numbers, it is certainly useful to consider the beginning of the sequences. For the $v' - v'' = -1$ and -2 sequences, we find in the sky: (1) radiations near the origin of the P and R branches; (2) radiations corresponding to rotational quantum numbers near $K = 10$. This distribution is not surprising. In the laboratory, we observe it in presence of active nitrogen; the same distribution was found by Dufay in the comets[2]. In this last case, the maxima correspond precisely to $K = 9$ or 10 when the distance from the sun is one astronomical unit.

It is difficult to go on with a similar attempt at identification for the $v' - v'' = 0$ and $+1$ sequences, for the P and Q branches of the successive bands overlap more and more. Further, we come to a region where the night sky spectrum is imperfectly known.

As to the 'tail' bands, it is interesting to notice that the coincidences observed by Kaplan concern the origin of the bands, although he did not express this precisely. After examination of the structure, we observed also good coincidences with the lines the rotational quantum numbers of which are near 10. These lines are usually the most intense in the laboratory.

Finally, it seems that the bands of the violet cyanogen system are found among the night-sky radiations the intensity of which does not increase obviously from the zenith to the horizon. But among the thirty radiations of the list mentioned at the beginning of this communication, there still remain twenty to identify.

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