include more 'laboratory method' in a university zoology course, with advantage to others besides the future schoolmasters. Fieldwork—both collecting and ecology—might also have more attention paid to it.

Most of what I have written applies, *mutatis mutandis*, to botany also.

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Nuclear Moments of the Gallium Isotopes 69 and 71

AN examination of hyperfine structure in the visible lines of the Ga II spectrum with a Fabry-Perot interferometer has shown the patterns due the individual isotopes to be distinctly separated by a difference in the magnetic moments of the nuclei. This permits the mechanical moments to be separately determined as $i = 3/2$ for both isotopes, in accord with previous determinations from incompletely resolved structures in Ga I lines[1] and Ga II lines[2]. The ratio of the $g(i)$ factors, given by the relative magnitudes of the hyperfine term separations, is 1·27, the less abundant isotope 71 having the larger magnetic moment.

These results are obtained from the structures of the $4s5s\ ^3S - 4s5p\ ^3P$ and $4s5p\ ^3P - 4s5d\ ^3D$ lines. The $4s4d\ ^3D - 4s4f\ ^3F$ lines, although not as well resolved, stand in qualitative agreement. The

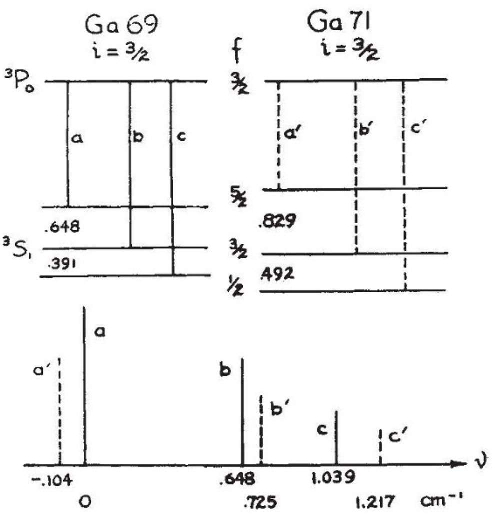

FIG. 1.—Hyperfine structure of λ 6456 in the spectrum of singly ionised gallium. The components due to 69 are indicated with full lines, those due to 71 with dotted lines.

observed structure of the line $^3S_1 - ^3P_0$ λ 6456 is given in Fig. 1, together with the term schemes. The centre of gravity of the 69 triplet, calculated from the theoretical intensities, falls at 0·389 cm.$^{-1}$, that of the 71 triplet at 0·393. Since the difference between these is not much greater than the probable errors in the measurements, it is safe to conclude only that an isotope shift, if present, is very small. The fact that components a' and b, of theoretical intensities 3 c_{71} and 2 c_{69} respectively, are photographed with very nearly equal densities at various exposures, gives the abundance ratio $c_{69}/c_{71} = 1{\cdot}5/1$.

The difference between the $g(i)$ factors observed here is noteworthy in that the only other example of isotopes with equal spins and unequal hyperfine separations is that of thallium, where the lighter isotope (as in the present case) exhibits separations 1 or 2 per cent smaller than those of the heavier isotope[3]. The remaining isotope pairs which have been reported with some certainty to have equal spins are copper 63, 65[4]; bromine 79, 81[5]; cadmium 111, 113[6]; rhenium 185, 187[7]. None of these has shown a perceptible difference in the hyperfine separation constants. It is true, however, that the hyperfine structure of the last four elements named is not so well suited to the observation of small differences as is the structure of the thallium lines, and it is possible that the gallium isotopes are exceptional only in the degree to which their magnetic moments differ.

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Dec. 24.

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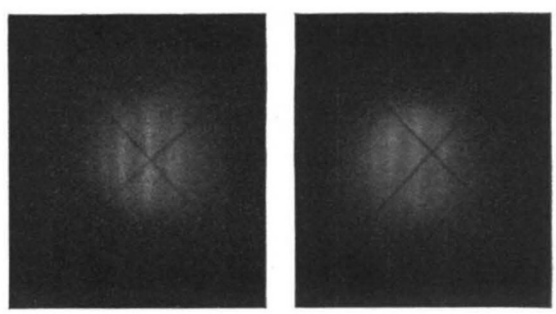
Negative Polarisation in Fluorescence

IN an important paper[1] Wawilow has reported measurements on the polarisation of fluorescence of solutions of some dye-stuffs in glycerine, when excited by radiations of different wave-lengths. Using for



(*a*) (*b*)
FIG. 1.

excitation the radiations from a mercury lamp, isolated by a quartz monochromator, he finds that the degree of polarisation shows a marked dependence on the wave-length of the exciting light. Starting from the visible region of the spectrum, as the wave-length of the exciting light is diminished the degree of polarisation decreases rapidly, passes through a minimum value (corresponding, in general, to excitation by λ 3125–3131), and rises again as we proceed farther towards the ultra-violet. The minimum value is usually *negative*; that is, the intensity of the fluorescent vibrations along the direction of propagation of the incident light is greater than that of vibrations in the perpendicular direction.

It is known, however, that the light that issues from a quartz (crystalline) monochromator is, in general, considerably polarised, and that the direction and the extent of polarisation fluctuate as we proceed along the spectrum. We have therefore repeated