The microphotometric records of the lines 4046 A. and 4077 A. in the scattered spectrum and of the line 4046 A. in the incident spectrum are reproduced in Fig. 1. The dotted part of the record in Fig. 1 (*a*) would be obtained in absence of the wing. On measuring the relative intensities in different parts of

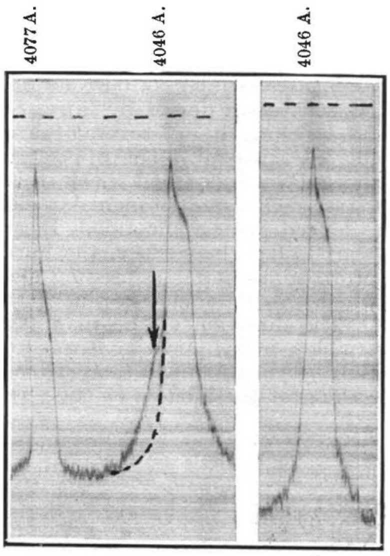

FIG. 1.

the wing, the curve reproduced in Fig. 2 is obtained. The approximate theoretical curve for the benzene molecule at 210° C. is shown by the broken line in Fig. 2. In view of the defects in the experimental arrangements, it can be concluded from the above results that there is fair agreement of the observed facts

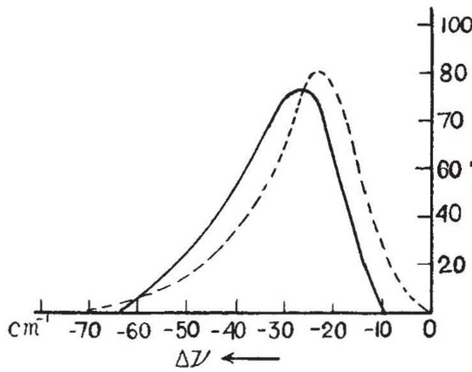

FIG. 2.

with the theory. Probably with a spectrograph having greater dispersion and with a denser picture, the agreement would be much better.

My thanks are due to Prof. D. M. Bose for his kind interest in the work.

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[1] *Z. Phys.*, **81**, 209; 1933.
[2] *Z. Phys.*, **68**, 782; 1931.
[3] *Ind. J. Phys.*, 8, 437; 1934.

Bands at 4450 and 4180 A. in the Spectra of the Night Sky and of the Aurora

IN the observation of the spectrum of the night sky or of the aurora by Vegard, Lord Rayleigh, Slipher, Sommer, Dufay, Ramanathan and others, it has already been reported that bands or lines appear in the regions near 4450 A. and 4180 A. These lines, which have been referred to by Lord Rayleigh as X_1 and X_2, were identified by Kaplan with the OII lines 4416·97 and 4169·23.

In the course of investigations of the band spectrum of nitrogen excited by very weak current under low pressure, I have observed three bands, which have heads at 4728·5, 4432·3 and 4165·9 A., respectively, in addition to other well-known bands. Of the three, the band at 4728·5 A. is the weakest. Under low dispersion, each of these three bands has apparently four intensity maxima (4744, 4740, 4736, 4730; 4448, 4443, 4439, 4434; 4179, 4175, 4172, 4167), and is little degraded towards the longer wavelength side. At ordinary temperature they are emitted only when the nitrogen gas is very pure; and the enhancement of their intensity relative to the second positive bands is observed with increased pressure of nitrogen, and with decreased density of the exciting current. Helium or neon gas exerts no appreciable effect when it was mixed with nitrogen, while the bands are almost quenched by the introduction of argon gas. At low temperature, especially at the temperature of liquid air, their intensity is markedly enhanced.

From the fact that the three bands are almost completely quenched when the temperature of nitrogen is high and when the persistence of vibration is brought out by the introduction of argon, and, therefore, the average vibrational and rotational energies of the normal nitrogen molecules are abnormally high, it is concluded that the upper state of emission is very unstable.

Taking into consideration the wave-length regions where they appear, together with the exciting conditions, it seems that there is a possibility of the identification of the Rayleigh bands X_1 and X_2 in the spectra of the night sky, and perhaps also of the aurora, as the Goldstein bands which I have described above.

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Nuclear Spin of Iodine

IN an earlier report[1] on the fine structures in the arc spectra of bromine and iodine, a tentative value of $\frac{9}{2}$ was proposed for the nuclear spin of iodine. The iodine arc spectrum was excited by a high-frequency electrodeless discharge, and as the structures were small and the individual components broad, it was pointed out that the spin value, which was based largely on one line, was not reliable because of imperfect resolution. It was definitely shown then that I was certainly $\geqslant \frac{5}{2}$.

I have now succeeded in exciting both the arc and spark spectra of iodine in a cooled hollow cathode discharge, and the resulting lines are considerably sharper than in the previous source. The fine structures in the spark spectrum, being on a much larger scale, are sufficiently resolved in some lines to enable an unambiguous spin value to be determined. Some fine structures in the spark spectrum have been previously reported by Wood and Kimura[2], but resolution was incomplete such that, for example, only five components were found in a line shown by the present observations to have ten. For this reason the conclusions about the spin drawn from these early data by Murakawa[3] require further examination.

A partial classification of the gross multiplet terms of the iodine spark spectrum has been given by Murakawa (loc. cit.) but even without this the nuclear spin can be deduced. Thus the lines in the accompanying table exhibit regular degraded quintet patterns, arising obviously from terms with $J=2$. (This agrees with the allocations which are taken from Murakawa.) The calculated interval factors for spins of $\frac{5}{2}$, $\frac{7}{2}$, $\frac{9}{2}$ are given. In a line free from perturbations, these should be constant, and it is quite evident that the nuclear spin of iodine is $\frac{5}{2}$. The slight irregularities in the interval factors calculated for the $\frac{5}{2}$ value are due to the small unresolved upper term fine structures.

Intervals in cm.$^{-1}$ × 10^{-3}

Line	Spin		
	5/2	7/2	9/2
λ 5496·8 $6\,^5S_2 - 6\,^5P_1$	9×47·5 7×47 5×47·5 3×50	11×39 9×36 7×33 5×30	13×33 11×30 9×26·5 7×21·5
λ 5774·7 $X_2 - 6\,^6P_1$	9×82 7×78·5 5×79 3×76	11×67 9×61 7×58 5×45	13×57 11×50 9×44 7×32
λ 5161·2 $6\,^5S_2 - 6\,^5P_3$	9×44 7×42·5 5×42 3×40	11×36 9×33 7×30 5×24	13×30·5 11×27 9×23 7×17

Structures have been measured in a large number of arc and spark lines and in some of these perturbations have been found. Full details will be published elsewhere.

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[1] *Proc. Roy. Soc.*, A, **136**, 585; 1932.
[2] *Astrophys. J.*, **46**, 181; 1917.
[3] *Sci. Pap. Inst. Phys. Chem. Res. Tokyo*, **20**, 285; 1933.

The Burrow of an Enteropneust

STIASNY described how *Balanoglossus clavigerus* lives in a U-shaped burrow, which is characterised by a regular funnel on the surface at the anterior end of the animal, with the coils of fæces at the posterior end. His illustration has been reproduced in several books. Morgan has also found similar funnels and masses of fæces in the case of another species of *Balanoglossus* and it is probable that all species of this genus inhabit similar burrows. Other species of Enteropneusta, for example, those belonging to the genera *Glossobalanus* and *Ptychodera*, live among the roots of seaweeds, under stones or in the sand in irregularly-shaped tubes of sand-grains, etc., cemented together by slime. It is known that most species of *Saccoglossus* (*Dolichoglossus*) prefer to live in a black muddy soil, but Davis is the only author who has described a special burrow for *Saccoglossus pusillus*, and according to his figure this burrow is irregularly formed.

In 1929, Dr. Mortensen collected near Lourenço Marques a new species of enteropneust, the description of which, under the name *Saccoglossus inhacensis*, will shortly be published by one of my students. When I visited the island Inhaca with a number of students in July 1934, we observed numerous specimens of this animal. It lives on the flats at the eastern side of the island, facing Delagoa Bay. In this area there is a surface layer composed of yellow sand, about 1 cm. in thickness, beneath which is a sandy mud, coloured black by its organic contents. *Saccoglossus inhacensis* inhabits burrows of a typical form, which were easily found by lifting a spadeful of mud and breaking it up, several burrows often occurring in one spadeful. The upper part of the burrow is irregularly coiled and within this part the long proboscis, collar and branchial region of the animal are lodged during low tide. Deeper down, about 4–5 cm. under the surface, the burrow takes the form of a regular spiral, consisting of up to six turns, in which the abdominal region of the animal is located. The direction of the main axis of the spiral is variable; in the majority it was found to be approximately vertical, but it may even be horizontal. Nothing of the burrow or tube was seen in

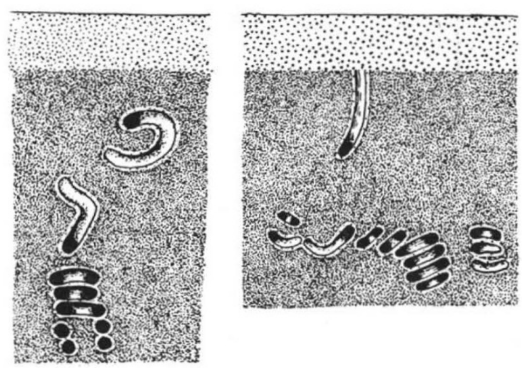

FIG. 1. Burrows of *Saccoglossus inhacensis*. $\frac{3}{4}$ natural size.

the upper layer of clear sand, and no indication of the presence of the animal was found on the surface during low tide. Apparently the animal behaves similarly to *Saccoglossus mereschkowskyi*, which according to Gurjanova and Uschakoff goes deeper down into the mud during low tide. On the other hand, Ritter found that *S. pusillus* protrudes its proboscis above the sand during low tide. It is likely that *S. inhacensis* does not make a permanent tube in the clear sand; it can easily push through this thin layer, when protruding from the burrow during high tide. The burrow itself is undoubtedly of a more permanent nature than is usually the case in Enteropneusta. The spiral part especially is so consistent that it can easily be detached from the surrounding mud.

In the dark mud the burrow is very conspicuous because it is lined by a thin layer of clear sand. This in turn is covered by a layer of slime, giving the inner surface a smooth, shiny appearance. A piece of the mud containing the burrow, such as is illustrated in Fig. 1, was preserved by allowing it to dry up partially, after which small quantities of gum arabic were carefully poured over it.

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