

shown that in every case in which light is scattered by the molecules in dust-free liquids or gases, the diffuse radiation of the ordinary kind, having the same wave-length as the incident beam, is accompanied by a modified scattered radiation of degraded frequency.

The new type of light scattering discovered by us naturally requires very powerful illumination for its observation. In our experiments, a beam of sunlight was converged successively by a telescope objective of 18 cm. aperture and 230 cm. focal length, and by a second lens of 5 cm. focal length. At the focus of the second lens was placed the scattering material, which is either a liquid (carefully purified by repeated distillation *in vacuo*) or its dust-free vapour. To detect the presence of a modified scattered radiation, the method of complementary light-filters was used. A blue-violet filter, when coupled with a yellow-green filter and placed in the incident light, completely extinguished the track of the light through the liquid or vapour. The reappearance of the track when the yellow filter is transferred to a place between it and the observer's eye is proof of the existence of a modified scattered radiation. Spectroscopic confirmation is also available.

Some sixty different common liquids have been examined in this way, and every one of them showed the effect in greater or less degree. That the effect is a true scattering and not a fluorescence is indicated in the first place by its feebleness in comparison with the ordinary scattering, and secondly by its polarisation, which is in many cases quite strong and comparable with the polarisation of the ordinary scattering. The investigation is naturally much more difficult in the case of gases and vapours, owing to the excessive feebleness of the effect. Nevertheless, when the vapour is of sufficient density, for example with ether or amylene, the modified scattering is readily demonstrable.

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#### Land-locked Salmon.

THE term 'land-locked' is generally used for fresh-water colonies of salmon, such as that from the River Otrá described in NATURE of Mar. 17, and from Lakes Wenern and Ladoga, and even for the Canadian Ouananiche. The word is, in my opinion, misleading, indicating that the colony is cut off from the sea, which is not always true, and that it owes its formation to this circumstance.

The fact that Lake Wenern has a stock of salmon indicates that it was formerly accessible from the sea; when the falls first became impassable to ascending fish they could scarcely have prevented fish from descending had they wished, so that none would be left. It seems clear that in the days when the lake was accessible from the sea, and salmon went through it to spawn in its tributaries, some of the smolts that descended into the lake found it to be a sufficiently good substitute for the sea to stay there, and so founded a non-migratory race, which became isolated later. Similarly with the River Otrá; some of the smolts reaching the Bygglandsfiord were tempted to stay and feed on the abundant pelagic crustacea, and founded a dwarfed race of lake-salmon, that was isolated when the falls became impassable.

The trout forms fresh-water colonies in every river and lake that it enters, and for this species the term 'land-locked' is never used. On this side of the

Atlantic the salmon generally leaves such colonisation to the trout, and itself forms fresh-water colonies only in exceptional circumstances, either in very large lakes with abundance of fishes, or in rivers or lakes with such quantities of parr-food that it is tempted to prolong the parr life. In America, when there are no trout, the salmon form fresh-water colonies more readily.

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#### Anomalous Groups in the Periodic System of Elements.

IN a paper which will shortly appear in the *Rend. Accad. Lincei*, I have calculated the distribution of the electrons in a heavy atom. The electrons were considered as forming an atmosphere of *completely degenerated* gas held in proximity to the nucleus by the attraction of the nuclear charge screened by the electrons. Formulæ were given for the density of the electrons and the potential as functions of the distance  $r$  from the nucleus.

In continuation of the previous work, I have applied the same method to the study of the formation of anomalous groups in the periodic system of elements. From the density of the electrons and their velocity distribution, one can easily calculate how many electrons have a given angular momentum in their motion about the nucleus, that is, how many electrons have a given azimuthal quantum number  $k$ .

It is known, for example, that the formation of the group of the rare earths corresponds to the bounding of electrons in  $4_s$  orbits, that is, to the presence in the atom of electrons with  $k=4$ . Now it follows from the theory that electrons with  $k=4$  exist in the normal state only for atoms with atomic number  $z \geq 55$ . This agrees well with the empirical result that the group of the rare earths begins at  $z=58$  (cerium).

Similarly, the bounding of  $3_s$  electrons with  $k=3$  corresponds to the anomaly of the first great period beginning at  $z=21$  (scandium); according to the theory, electrons with  $k=3$  should appear in the atom just at  $z=21$ .

Further details will be published later.

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#### Activation of Ergosterol at $-180^\circ$ C.

WITH reference to the letter in NATURE of Mar. 24, p. 452, from Dr. Bills and Mr. Brickwedde, on the activation of cholesterol at liquid oxygen temperature, we may mention that we are now studying the production of vitamin D from ergosterol by ultra-violet radiation at various temperatures, and have obtained intensely active products at  $-180^\circ$  C. from weak alcoholic solutions immersed in liquid oxygen, as well as at higher temperatures up to  $+78^\circ$  C. Details will be published shortly. Our results therefore are similar to those of Bills and Brickwedde, and are made with the pure provitamin instead of with 'cholesterol.'

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