other characters. It may be significant that the change from *Uria aalge albionis* to *Uria a. aalge* corresponds with the first zone of change in percentage of bridling, but it does not seem safe to postulate a causal connexion between the cline in polymorph frequencies and that in melanin pigmentation on the present evidence.

The genetic situation involved is of some interest. From the non-existence of intermediate forms it may be assumed that the control is unifactorial. Whether it behaves as dominant or recessive is, however, less clear, and only breeding experiments or ringing of wild populations could decide this.

This method of describing sub-species and forms makes a useful addition to the usual taxonomic procedure and gives important information as to the processes of species differentiation, the methods by which isolation arises in a widespread group and the speed with which genes may diffuse across such barriers.

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Tellurium Tetrafluoride

THE formation of a white solid which accompanies the main product tellurium hexafluoride when fluorine is passed over tellurium has often been noticed but its composition has not been settled (Moissan[1], Prideaux[2]). Yost and Claussen[3] showed that the same or a similar substance is formed by heating the hexafluoride with tellurium in sealed glass tubes, but they were unable to identify the product, which they state is probably the difluoride, TeF_2.

We have re-investigated the reaction using sealed tubes of both glass and silica. With the hexafluoride alone in the tubes, no reaction occurs and the density of the gas remains unchanged. With tellurium present, a white solid is formed at a temperature of about 200° C. The ratio of fluorine to tellurium in this solid is not constant but decreases with the time the tube is heated, until after heating for several days, the fluorine content becomes very small and the solid approximates in composition to TeO_2. At the same time the gas pressure in the tube rises and finally attains a value 1·5 times the initial pressure. The gas, originally pure TeF_6, is converted completely into SiF_4, as shown by vapour density measurements. The most probable explanation of these facts seems to be that the first product of the reaction is the formation of a new compound, tellurium tetrafluoride, which then reacts with the silica giving silicon fluoride and tellurous oxide :

(1) $2TeF_6 + Te = 3TeF_4.$
(2) $3TeF_4 + 3SiO_2 = 3TeO_2 + 3SiF_4.$
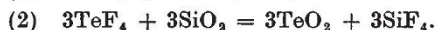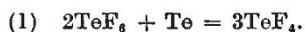
Further investigation has confirmed the correctness of this interpretation. We have found that the product of the first reaction can be isolated by using a tube composed of pure crystalline alumina. This material, as supplied by the Thermal Syndicate, Ltd., is non-porous and is the only one we have found which is not attacked by this reaction.

In these conditions, the tellurium hexafluoride is absorbed completely by the tellurium at about 200° C., forming a colourless solid which crystallizes in fine needles on the walls of the tube. On exposure to ordinary air, the solid hydrolyses very rapidly with evolution of hydrogen fluoride. By dissolving this product rapidly in aqueous potash, we have been able to determine the ratio F : Te in the substance. Two independent experiments showed it to approximate closely to 4 : 1.

Quite recently we have been able to prepare larger amounts of the white crystalline material free from excess of tellurium, and to analyse it completely. As a mean of two experiments, we find for its composition : Te = 62·5 per cent, F = 38·7 per cent. The formula TeF_4 contains Te = 62·6 per cent, F = 37·4 per cent. The fluorine was estimated as lead chlorofluoride after precipitation of tellurium as dioxide—a method which we have found to give rather high results when used for the estimation of this element in compounds of tellurium and fluorine.

The results can therefore be regarded as satisfactory, and there can be little doubt that the white solid we have obtained is a new fluoride of tellurium, TeF_4, which on account of its reactive behaviour with glass and silica and its instability in presence of traces of moisture has not been isolated previously.

Further experiments on the properties and behaviour of this substance are in progress.

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Fate of the Sulphate Radical in the Animal Body

PHOSPHORUS enters as phosphate in the numerous compounds in which it is to be found in the animal body ; in connexion with the investigations carried out in recent years concerning the fate of ingested phosphorus atoms in the organism, it seemed to be of interest to determine whether or not, in the course of the numerous metabolic processes in which phosphorus is involved, the phosphate radical exchanges its *oxygen* content with other oxygen atoms present in the body. This question could be answered by injecting into an animal sodium phosphate which contained heavy oxygen (^{18}O) as an indicator and then determining if the phosphate recovered in the urine, for example, contained more than the normal amount of [18]O.

As, however, it was recently found[1] that 'heavy-oxygen phosphate' can be obtained by dissolving sodium phosphate in 'heavy-oxygen water' and vice versa, it is apparent that the oxygen atoms present in phosphate radicals exchange their places freely in water and there can be scarcely any doubt that the probability is extremely small of a phosphate radical leaving the body coupled to the same oxygen atoms with which it entered. Sulphate ions, on the other hand, have been found[2] to exchange oxygen atoms either not at all or at a very slow rate with neutral water, even at 100° C., and it seemed of interest, therefore, to investigate whether sulphate ions during their circulation in the body participate in chemical reactions which loosen the oxygen bonds sufficiently to make an oxygen exchange possible.

In the experiments we wish to report here, sodium sulphate containing heavy oxygen was prepared from heavy-oxygen water, kindly presented to us by Prof. Urey[3], having a density 740 parts in a million greater than that of normal water. The reaction used for the preparation of the 'heavy sulphate' was that which takes place between SO_2Cl_2 and heavy-oxygen water in the presence of traces of iodine as a catalyst. 1 gm. of the dry material, converted into 50 c.c. of solution, was injected into a rabbit ; we are very grateful to Miss Lindberg, of Prof. Krogh's laboratory, for making the injections. The urine of the rabbit was then collected for 24 hours, its sulphate content recovered as barium sulphate, the oxygen content of the latter converted into water, and the density of this determined. The preparation of water from the oxygen of the sulphate was carried out in the following way. The barium sulphate precipitate was dried at 400° C. in a stream of nitrogen and then reduced with purified carbon at 900° C. ; the gases evolved were mixed with a great excess of hydrogen and stored over oil in a gasometer ; and, finally, the gas mixture was led over a nickel catalyst at 310° C. and the water formed collected. The density determination was kindly carried out by Mr. O. Jacobsen, using Linderstrøm-Lang's floating-drop method.

Should the sulphate oxygen, during its stay in the animal, enter into exchange reactions with other oxygen atoms present in very great excess in the body, the oxygen of the heavy radicals would be replaced by normal oxygen atoms and the water prepared from the sulphate recovered from the urine would show the density of normal water. If, on the other hand, the sulphate ions injected retain the oxygen atoms with which they start, the water prepared from the urine sulphate should show an excess density of 370 parts per million if no secretion of normal sulphate took place. The water prepared from the sulphate isolated from the urine after injecting heavy-oxygen sulphate has shown a very appreciable density excess—240 parts per million. When comparing this value with the one calculated on the assumption that no exchange of sulphate oxygen took place, we must consider the following fact. Besides the heavy-oxygen sulphate—0·84 gm. of sodium sulphate being secreted in all during the day following injection—the urine contains also sulphate, even when no injection is given, the amount of which we found to correspond to 0·23 gm. per day. The latter is normal sulphate and its presence reduces the density excess of the water prepared from the urine sulphate.

From the high density found for the water prepared from urine sulphate, one must conclude that most of the individual sulphate ions injected into the rabbit are recovered in their original form, and from this it follows that at least the greatest part of the sulphate administered leaves the body unchanged, and also that none or only a small part of the ingested ions exchange as such with other sulphate ions present beforehand in the tissues.

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Distribution of Phosphorus in the Leg Bones of Chickens

IN rickets, as is generally known, the total phosphorus content of the bones is diminished. We have started now to investigate the distribution of phosphorus in the leg bones of normal and rachitic chickens with a radioactive phosphorus isotope as an indicator.

The active phosphorus used was prepared by Dr. F. A. Heyn, of the Philips Lamp Works at Eindhoven, with a Philips neutron generator[1]. A fixed quantity of the active phosphorus was injected intraperitoneally as an aqueous solution of sodium phosphate of pH 7·2. The chickens were decapitated 22 hours after the injection and quickly sectioned. The leg bones were then dissected and cleaned. One of the leg bones of each bird then was divided into three parts, namely, the proximal epiphysis, the distal epiphysis and the diaphysis. The two epiphysial parts of the bone were then carbonized together in an oven at 200° C. ; the same was done with the diaphysis. Preparations for the determination of the radioactivity were made in the manner described previously[2]. In addition, a part of the residue of carbonization was used for the estimation of the total phosphorus according to Fiske-Subbarow.
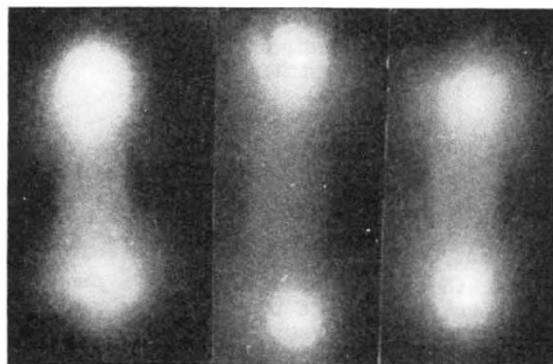
As was to be expected, the provisional figures from eight chickens showed that the phosphorus content of the dried matter in the epiphysial part and in the diaphysial part is larger in normal than in rachitic chickens. Furthermore, it was observed that both in normal and in rachitic chickens, the phosphorus content from the diaphysial part of the bone seems to be larger than that from the epiphysial part of the same bone.

With regard to the distribution of the active phosphorus administered, it was observed that, both in the normal and in the rachitic chickens decapitated 22 hours after the injection of the labelled phosphorus, the quantity of the active phosphorus in 1 mgm. of bone phosphorus was larger in the epiphysis than in the diaphysis. Furthermore, it was observed that both the epiphysis and the diaphysis from the rachitic birds, decapitated 22 hours after the injection of the labelled phosphorus, contained a much larger quantity of the active phosphorus in 1 mgm. bone phosphorus than the normal chickens.

The second leg bone of each chicken was not carbonized, but after being cleaned was placed on a double coated X-ray film. It remained on this film for some days, according to the quantity of radioactive phosphorus injected. The film was then