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ADDRESS OF THE PRESIDENT OF THE ROYAL SOCIETY[1]

By Sir WILLIAM BRAGG

DIRECTOR OF THE ROYAL INSTITUTION

ACCORDING to our honored custom I preface this annual address by references to those of our fellows whom death has taken from us during the past year.

The past year has included many events which might well be mentioned in this annual address. One of them has, however, elbowed out most of the rest. The two numbers of *Notes and Records* which have begun a new enterprise contain interesting and informative accounts of our doings since last November. I believe that fellows have appreciated this social and intimate addition to the publications of the society, and that they will join with me in an expression of our gratitude to the officers who have produced it, and especially to the one who has on this, as on so many occasions, taken the lion's share of the work. The doings of the society are noted and recorded in this periodical more effectively than I could do in a presidential address.

I must now speak of an event which is surely uppermost in the minds of all who have received the nominations of council for next year. We are to lose the services of Sir Frank Smith. You may be surprised at his decision not to seek renomination when we would gladly have kept him for one more year. It happens, however, that two more of our officers must step down at the end of next year, and Sir Frank has pointed out that if three were to leave at one time the business of the society might be seriously affected. We can not, therefore, ask him to stay. We must take advantage of the opportunity thus given us to tell him how grateful we are for the work he has done for the society. His secretaryship has been distinguished by a rare exhibition of capable service. The place which the society fills in public life and its harmonious cooperation

1 Given at the anniversary meeting on November 30, 1938. The address also contained obituary appreciations of the fellows who died during the year.

tained a small amount of the nitrogen isotope. Both experiments must be taken as proof that at least a small amount of creatine and amino acids can be formed with ammonia as a nitrogen donor and that dietary ammonia may be utilized for this process.

In another experiment the fate of one dietary amino acid, tyrosine, was followed in a full-grown adult rat kept in nitrogen equilibrium on a normal diet, the protein of which consisted of casein. To this was added an amount of isotopic *dl*-tyrosine corresponding to only 14.4 mg nitrogen addition per day. The animal was kept on this diet for ten days. It excreted an amount of total nitrogen equivalent to that in the total diet, but about half of the isotope was retained by the tissues. The retention must have been accompanied by the liberation (for excretion) of an equivalent amount of nitrogen. The liver and the remaining carcass were worked up separately to locate the isotope. Almost all of it was recovered in the proteins, while the non-protein-nitrogen revealed only traces. Both liver and carcass proteins were hydrolyzed, and pure tyrosine was isolated. The samples contained a high concentration of isotope, indicating an extensive deposition of the dietary tyrosine in the body proteins. However, the isotope content in tyrosine accounted for only about one quarter of the total isotope content in the proteins. Amino acids, other than tyrosine, must thus have taken up nitrogen originally present in tyrosine. This could be proved. The following other amino acids were isolated: arginine, lysine, histidine and the mixture of the dicarboxylic acids, glutamic and aspartic acid. With the exception of lysine, all of them contained a significant amount of isotopic nitrogen. As the dicarboxylic acids contain only 1 nitrogen atom per molecule, the position in the molecule of the newly introduced nitrogen is certain. The position of the isotope in the arginine and histidine, both of which contain more than one nitrogen atom per molecule, had to be investigated. The arginine isolated was split into ornithine and urea. All the isotope was found in urea moiety, while the ornithine contained normal nitrogen. The α-amino group of histidine was removed by converting the amino acid into imidazole lactic acid. The latter contained normal nitrogen; all the isotope must have been in the α-amino group of the original histidine.

The experiment shows that in a normal full-grown and healthy animal, kept on a normal diet, the nitrogen of at least one of the dietary amino acids, tyrosine, is only partly excreted in the urine, while the rest is retained in the protein of the animal, with a corresponding excretion of tissue nitrogen. Only a fraction of the nitrogen deposited remains attached to the original carbon chain of the amino acid, with which it was given, the bulk being utilized in the formation of some other amino acids. Degradation of some of the isolated amino acids has given some insight into the processes which must have been responsible for their formation:

(1) The dicarboxylic acids containing only one nitrogen atom were either newly synthesized from substances with different carbon chains or underwent deamination followed by amination of the remaining keto acid. Whichever of these two processes was responsible, its occurrence was not suppressed by the abundance of these substances in the dietary protein, casein.

(2) Arginine was formed from ornithine, probably in the course of urea formation, according to the theory of Krebs.

(3) Histidine was successively deaminated and reaminated at the α-carbon atom alone.

(4) Ornithine and lysine are apparently not subject to such processes.

All these reactions had occurred with constituents of the proteins of a normal animal and reveal an extensive chemical activity of its proteins.

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BOOKS RECEIVED

Brooklyn Botanic Garden Record; Vol. XXVII, No. 3, July, 1938; Contents: Botanic Gardens of the World; Materials for a History. Second edition. Pp. 151–406. Brooklyn Institute of Arts and Sciences. $2.50.

DEN HARTOG, J. P., and others. *Contributions to the Mechanics of Solids Dedicated to Stephen Timoshenko by his Friends on the Occasion of his Sixtieth Birthday Anniversary.* Pp. vii + 277. Illustrated. Macmillan. $5.00.

FAIRCHILD, DAVID. *The World Was my Garden; Travels of a Plant Explorer.* Pp. xiv + 494. Illustrated. Scribner's. $3.75.

Fondation Universitaire. *Statistiques des Diplômés de l'Enseignement Supérieur en Belgique.* Pp. 99. Universitaire Stichting, Brussels.

GIDDENS, PAUL H. *The Birth of the Oil Industry.* Pp. xxxix + 216. Illustrated. Macmillan. $3.00.

LICHTIG, IGNAZ. *Die Entstehung des Lebens; Durch Stetige Schöpfung.* Pp. xx + 371. 4 figures. Noord-Hollandsche Uitgevers Maatschappij, Amsterdam. Gulden 6.

NEEDHAM, JOSEPH, and WALTER PAGEL, Editors. *Background to Modern Science; Ten Lectures at Cambridge Arranged by the History of Science Committee, 1936.* Pp. xii + 243. Macmillan. $2.00.

RITTER, WILLIAM E. *The California Woodpecker and I.* Pp. xiii + 340. 28 figures. University of California Press. $3.50.

TOLMAN, RICHARD C. *The Principles of Statistical Mechanics.* Pp. xix + 660. Oxford University Press. $9.00.

ULICH HERMANN. *Kurzes Lehrbuch der Physikalischen Chemie.* Pp. xv + 315. 79 figures. Steinkopff, Dresden. RM 12.