

utilisation of mineral sulphur in the synthesis of thiamine, secreted with the milk, has been established.

Great attention has been devoted in recent years to a study of sulphur metabolism in sheep in connection with wool production. In these researches organic and mineral compounds of sulphur-35 (methionine, cystine, thiourea, thiamine, sulphates and sulphides), were used.

The introduction of marked sulphur into the organism of a sheep, for instance, leads to the deposition of sulphur compounds in the wool, leaving a radioactive track in it. When the introduction of tracer sulphur is repeated a few days later a second radioactive track appears in the wool. A special method is used to obtain this track: the clipped wool of a sheep is placed on a sensitive film, the film together with the wool is wrapped up in light-proof paper, and left thus for several days. The film, after development shows clear marks of radioactive tracer substances, in this case due to radioactive radiation of the tracer sulphur contained in the albumens of the wool. By measuring the distance between the two radioactive marks we determine the speed of growth of the wool. Many such marks can be made. This makes possible an objective measurement of the acceleration and retardation of the growth of the wool in accordance with the conditions of feeding and the biological state of the animals.

This method can also be used to determine the specific features of the growth of the wool of the foetus, by giving radioactive substances

to the sheep, while with young, and measuring the distances between the marks on the wool of the lambs after birth.

The process of calcification of the egg-shell in hens with a high laying capacity was also studied. With the help of calcium-45 it was shown that the calcium contained in the feed is deposited in the bones, and that only the skeleton serves as the direct source of calcium in the formation of the egg-shell.

In connection with investigation of the Urov endemic disease in the Amur and Chita Regions a study was made of calcium, phosphorus and sulphur metabolism (with the aid of chloride of calcium-45, phosphate, containing tracer phosphorus-32 and sulphate, containing sulphur-35) in the bones of animals in cases of excess of strontium in the fodder. A study of bone-sections established the influence of strontium on the deposition of calcium and phosphorus in the bones, and on the content of phosphorus and sulphur in the epiphyseal and articular cartilage. These researches are helping to establish the causes of the Urov disease and to find methods of combating it.

The method of tracer atoms, a new one in research, has a short history as yet but it has already enabled us to penetrate into the innermost processes of metabolism and to study processes of life hitherto hidden from us. The use of tracer atoms makes it possible to expand and deepen the range of theoretical problems which have to be studied for the solution of practical tasks of the development of animal husbandry.

ANIMAL ORGANISMS BUILD UP PROTEIN FROM BREATHED-IN NITROGEN

IT has been known for a long time that bacteria assimilate nitrogen from the air. At present, we know the mechanism of nitrogen assimilation by the bacterial cell and have a good knowledge of the enzymes involved in the process. As to plants, existing theory holds that they can utilise free atmospheric nitrogen solely due to the activity of soil bacteria and those living on the tubercles of bean plants. In both cases, bacteria combine atmospheric nitrogen into chemical compounds that can be assimilated by plants. There has so far been no indication that plants can assimilate nitrogen directly from the air. The way to absorbing atmospheric nitrogen in animal organisms appeared to be longer still. It was thought that animals could receive it only as part of vegetable food and not, by any means, directly from the air.

Certain experiments which recently have been carried out by Professor Mikhail Valsky, a mechanical engineer, indicate that animal organisms build up protein from nitrogen breathed-in from the air.

Valsky placed eggs in an incubator with an atmosphere in which the nitrogen was replaced by the inert gas argon. Within four days the embryos were dead, while eggs from the same batch kept in an incubator with a normal atmosphere (all other factors being kept equal) developed normally.

In another experiment young chicks were placed in an atmosphere identical with that of the first incubator. Within six hours their wings dropped and twelve hours later they were dead. Their brood-mates, kept under the same conditions, except that they had nitrogen in the air they breathed, developed normally.

As a final check, eggs were hatched in an incubator in which the ordinary nitrogen had been replaced by the stable isotope nitrogen-15. When protein—taken from the embryos was analysed, it was found that there had been a significant increase in the nitrogen-15 content. This nitrogen could have come only from the atmosphere in the incubator.

These experiments seem to show that what used to be regarded as an inert gas and a

diluent of atmospheric oxygen had proved to be a gas which is assimilated, though in small quantities, immediately from the air to become part of proteins forming in animal organisms. If further investigations confirm Valsky's findings, they may amount to a major breakthrough in modern biology. (By Courtesy of the USSR Embassy in India.)

OBITUARY

PROF. C. R. NARAYAN RAO

PROF. C. R. NARAYAN RAO, who died on January 2, 1960, took a prominent part in the development of Biology in the Mysore University over a period of thirty years. He was born in Coimbatore on August 15, 1882, and had his early education in Bellary. He later went to the Madras Christian College where he came under the inspiring influence of Professor Henderson who was the Head of the Zoology Department there. He graduated B.A. and later M.A. of the Madras University and was awarded a Gold Medal for proficiency. He obtained a Diploma in Teaching too. After brief periods of teaching in Coimbatore and Ernakulam, he came to the Central College, Bangalore, to organize its Zoology Department and remained its Head until his retirement in 1937.

Narayan Rao made important contributions to Science in India in two ways: first, by his researches on Indian Zoology and, secondly, by his activities in connection with the advancement of Science in the country. He named and described many new species of frogs and his presidential address to the Zoology Section of the Indian Science Congress in 1938 at Lahore dealt with the wealth of the problems in this rich group. His work on the Archenteric and Segmentation Cavities of Frogs was recognized by Goodrich as a reorientation of our concepts of Amphibian development. And his account of the ovarian ovum of the slender Loris formed part of J. P. Hill's Croonian Lecture to the Royal Society. It was under his inspiring influence that some of us came to recognize scientific research as an integral part of University teach-

ing. If today, the Department of Zoology, Central College, has come to obtain the recognition as a centre of research in the country, it is entirely due to his initiative and inspired guidance.

Prof. Narayan Rao early recognized the need in India for a journal of the type of *Nature* in Britain. The increase in the tempo of scientific research in the Universities and Institutes of Learning demanded a vehicle for the speedy publication of results and with the initiative and support of Sir M. O. Forster and others, *Current Science* was started in 1932. On Prof. Narayan Rao fell the responsibility of being the journal's first editor. He discharged it so thoroughly and successfully that *Current Science* has now come to occupy an important position among the scientific periodicals of the world.

Again, it was in one of the editorials in *Current Science* (1932, 1, 335) that he urged the need for a scientific body in the country to co-ordinate scientific research and to provide a forum for scientific discussions and meetings. The founding of the Indian Academy of Sciences at Bangalore under the Presidentship of Sir C. V. Raman was a result of this appeal. He actively co-operated in the task of organizing the Academy, and the standing and reputation which the Academy now enjoys are due not a little to the sound basis on which it was founded.

Prof. Narayan Rao had a warm personality, intensely human and friendly. His death is a grievous loss to his many friends and past students.

B. R. SESHACHAR.
