operation. Many improvements have been devised since this first model was made.

To keep the telescope as cool during the daytime as at night, the steel dome will be insulated with aluminum-foil. A relatively light main shutter 22 feet wide will travel up and over the dome. When stars high in the sky are being studied, the partially-closed shutter will serve as a windscreen.

In the new building the lens can be tested both in flat and upright positions without being taken out of the grinding room. A section of the floor above the grinding machine can easily be removed and a knife-edge test stand mounted on the crane carriage 89 feet above the mirror, still safe in the grinding pit. This arrangement plus the light tunnel will cut to a minimum the time spent in testing the lens.

"The design of the telescope is really quite conservative," states Dr. Shane. "It was kept this way so that almost any type of auxiliary equipment usable on large telescopes could be installed when needed."

The new telescope will take astronomers 5,500 billion billion miles out into space. It will make visible faint stars and cities of stars beyond the reach of all but the Palomar giant. Although it will not be in operation for a few years, astronomers are planning how to use its time to best advantage.

When the moon is new and the night sky visible in all its glory, the motion and rotation of star systems far out in space will be studied by Dr. Nicholas U. Mayall and other astronomers of Lick Observatory. When the full moon makes the sky too bright, Lick's Dr. George Herbig and Dr. Otto Struve of the Leuschner Observatory in Berkeley will have a chance to study the dispersed light of stars in order to determine their structure and chemical makeup.

Lick astronomers Drs. Gerald Kron and Olin J. Eggen are looking forward to attaching their photoelectric equipment to the new telescope to determine more exactly light changes in certain faint stars and nebulae. Dr. Shane expects to search for far-away systems of millions of stars and estimate their number in sample sky regions.

Whatever time is left from these studies also will be well spent. This new giant eye, like its astronomical brothers, will work hard to extend man's knowledge of the vast universe of which our earth is a tiny part.

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ANIMAL NUTRITION

Chickens Make Protein

Radioactive sulfur injected into chickens shows up in egg as cystine, proving that poultry can convert inorganic sulfur to a protein.

➤ CHICKENS can make one of their own proteins from inorganic sulfur, a feat previously believed possible only for green plants and microorganisms. It is the first time that an animal has been known to make a protein from inorganic sulfur.

The protein the chickens make is cystine. And the fact that they can build this protein may mean cheaper feed bills for the farmer, although further experiments are needed to find out exactly how much cystine is made by the chicken.

Discovery of the protein-building process was described by L. J. Machlin of the U. S. Department of Agriculture, Beltsville, Md. He reported to the American Institute of Nutrition meeting in New York that radioactive sulfur was used to show that chickens can make their own cystine. Dr. H. R. Bird, Dr. P. B. Pearson and C. A. Denton were co-workers in the experiments.

The scientists injected very dilute sulfuric acid containing radioactive sulfur into the hens. When they tested the eggs laid by these hens, radioactive sulfur was found.

Proteins are made up of amino acids, nature's building blocks, of which there are about 20. Two of these, methionine and cystine, contain sulfur and are found in nearly all proteins.

Green plants and microorganisms make methionine and cystine using inorganic sulfur such as sulfuric acid and its salts, but this process was supposed to be impossible for animals. They were believed to get all of their sulfur-containing amino acids by eating plants or by eating the meat of other animals that ate plants.

To find out exactly what was the form of the radioactive sulfur, the proteins were broken down into amino acids and the sulfur-containing cystine and methionine separated by paper chromatography.

"When the paper strip having methionine was brought close to a Geiger counter," Dr. Bird told SCIENCE SERVICE, "there was only the usual number of background clicks. When, however, the paper strip containing cystine was tested, the counter sounded like a corn popper."

Thus they showed that the hens were able to use inorganic sulfate to make cystine but not methionine. The chickens have to depend on their diet for pre-formed methionine.

Now the poultry specialists would like to find out just how much cystine is made by chickens, Dr. Bird stated. The radioactive detecting method is so sensitive that only very small amounts of cystine may be involved. He also pointed out that the chickens on which these experiments were performed were already getting adequate amounts of both cystine and methionine in their standard diets, so would not need to make it for themselves at all, although they did anyway. It would be interesting, he said, to test chickens not fed cystine for then there might be some biological incentive to make the protein.

But the fact that the hen can make cystine at all is of great importance, because the United States has never had enough protein to feed its livestock population for most efficient production of meat, milk and eggs.

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