penetrating power of the cosmic rays. As is well known, my earlier experiments with Prof. Werner Kolhorster (reported by Science Service in January, 1930) showed that the properties of the cosmic rays are very different from those of a gamma radiation, and that the cosmic rays behave rather as a corpuscular radiation. Dr. H. Becker and I have now carried out the same experiments with the gamma rays from beryllium; it turns out that these still behave completely like a normal gamma radiation and quite differently from the cosmic rays. This is further strong support for the idea that the cosmic rays have a particle-like nature in the lower layers of the atmosphere.

A series of other light elements, as well as beryllium, can be artificially excited to gamma ray emission. The production of artificial gamma rays is just as general a phenomenon as the breaking up of atomic nuclei. In this radiation we have a means of studying the structure of the lighter atomic nuclei; we are standing at the threshold of a "nuclear spectroscopy." Indeed the light atom nuclei are of special interest.

Science News Letter, March 12, 1932

BIOCHEMISTRY

Scientists Learning Secret of How Plants Manufacture Food

THE CHEMICAL process which scientists consider most essential to life on earth and which so far has eluded the most penetrating and painstaking research is now yielding its secrets to Prof. James B. Conant of Harvard.

Prof. Conant is helping find how plants use sunlight to change the inert gas, carbon dioxide, plus water, into sugars and starches on which they live and grow. The key to his work is a new formula which he suggests for chlorophyll, the complex green substance that is instrumental in converting raw materials into plant food.

He described the formula when he was recently presented the Nichols medal of the New York section of the American Chemical Society in recognition of this work. Scientists have known for some time that each molecule of chlorophyll *a,* one of the two chlorophyll compounds, contains 55 carbon, 72 hydrogen, five oxygen and four nitrogen atoms, and one magnesium atom. Prof. Conant has worked out a formula like a crazy-quilt pattern which shows how these atoms are joined together.

Advances Summarized

Notable advances in the same field of work for which Prof. Conant was given the Nichols medal have been made by German scientists.

"The green coloring material of plants was shown by the German scientist Willstaetter in 1912 to be a mixture of two compounds, chlorophyll *a* and chlorophyll *b*." Prof. Conant said. "These substances absorb sunlight, which thus furnishes energy for the production of sugar and starches from carbon dioxide. Willstaetter showed that the chlorophyll molecule contains magnesium and can be converted by drastic treatment into a series of red compounds known as porphyrins. A similar, but not identical, porphyrin is responsible for the red color of blood. It is protoporphyrin which combined with iron and a protein is hemoglobin, the actual red blood coloring material.

"In the last five years Hans Fischer of the University of Munich has discovered how to synthesize porphyrins and has thus established the structure of the blood porphyrin and the chlorophyll porphyrins. This knowledge is fundamental to an understanding of chlorophyll.

"These porphyrins are compounds with a large ring made up of four smaller pyrrole rings each containing a nitrogen atom. The relation between the green chlorophyll *a* compounds and the red porphyrins, and the nature of certain additional groupings of atoms characteristic of the chlorophyll molecule have been the subject of study at Harvard in the last four years."

Prof. Conant pointed out that the American research has shown that the green series of compounds derived from chlorophyll *a* has as its basis the nucleus of the porphyrin plus two hydrogen atoms. A similar relationship is well known between benzene, or benzol, and the terpenes, such as occur in essential oils. Thus chlorophyll *a* has as its base a reduced porphyrin ring.

PROF. JAMES B. CONANT
—who is attacking one of science's most difficult problems.

Chlorophyll *b* is like chlorophyll *a* except for the fact that one oxygen atom replaces two hydrogen atoms on the ring.

Prof. Conant declared that the final formulae for chlorophyll *a* and *b* must be considered as provisional. But he believes the essential nature of all the atomic groupings in the molecule is understood.

Science News Letter, March 12, 1932

ENTOMOLOGY

Cannibal Grasshoppers Infect Selves with Fungus

GRASSHOPPER species that practise cannibalism on the bodies of their defunct brethren may be unwittingly arranging for their own demise from the same disease. This is indicated by results of an investigation announced in *Science,* by Maurice T. James of the University of Colorado.

Mr. James laid out a number of freshly-killed grasshoppers of a common western species, and found that the bodies were attacked by members of the same species, which bit into the bodies from underneath and ate out the soft contents of the thorax or chest region. He also found that in at least a few cases the grasshoppers also ate the bodies of their comrades that had died of a fungus disease. This suggests a "sure-fire" method by which this disease may be spread in nature.

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